Jefferson County PUD

Open-Access Feasibility Analysis

March 3, 2021

CCG CONSULTING

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EXECUTIVE SUMMARY

CCG Consulting was engaged to assist the PUD in looking at the possibility of operating an open-access network on fiber in Jefferson County. That work incorporated some work done previously for the PUD. CCG's effort included the following:

- This report describes the goals that the PUD needs to adopt before you can fully assess your willingness to move forward with an open-access business. These goals include goals you have for broadband coverage in the county, goals related to the financial parameters of funding and operating a broadband network, and operational goals on how you might work with ISPs and operate the business.
- The report discusses pricing philosophy. It discusses how open-access rates typically translate into retail rates so that the PUD can understand how your rates and terms for products will ultimately shape the retail rates that ISPs charge to the public.
- The report talks about the roles and responsibilities of the PUD and ISPs in an open-access environment. We recommend that you clearly define goals before entering the business so that everybody understands their obligations.
- The report looks at the residential and business access rates charged by other PUDs in Washington. This includes the topic of connection charges – how much to charge a customer to join the fiber network.
- CCG was tasked with creating financial feasibility models that examine the financial feasibility of operating an open-access business. We ended up creating 44 separate scenarios that look in-depth at the impact of changing key variables of such a business, such as customer penetration rates, the cost of debt, the cost of the needed assets, etc. The report describes the assumptions used in the analysis as well as the results we obtained.
- The report discusses ways to look for ISPs to operate on an open-access network.
- The report also discusses the role the PUD ought to consider in marketing the existence of a fiber network.

The financial analysis supports what was expected before the analysis. It looks challenging, but not impossible, to operate an open-access network in the county. However, to make such a business viable the PUD must be able to control some key variables:

- The customer penetration rate,
- the interest rate on debt,
- the term of debt borrowing.

Any of these three variables can sink the business if you can't achieve the desired results.

The corollary of this is that the open-access business can succeed if the PUD can take advantage of every opportunity that will help results. That means getting some combination of some or all of the following:

- A low interest rate on debt is key. While 3.25% may not sound like a high interest rate, the open-access business is going to have a hard time covering debt at that rate.
- The PUD elected to use a 40% penetration rate in the analysis to be conservative. However, it's clear that you are going to have to do better than that. Ideally, the penetration rate ought to be at 50% or more to provide some safety for an open-access business plan.
- Again, since debt payments are one of the most important factors in breaking even, the analysis shows you need to find 30-year debt if at all possible.

- Infusing some external equity looks to be mandatory. This could be a continuation of using property taxes, grants, or some combination of the two to fund fiber.
- The base analysis starts with a base residential loop rate of $35. That likely translates into a retail rate of around $65. The business plan would benefit by creeping rates higher than $35, but you have to be aware of the impact of high retail rates on customer penetration for the network.
- Even should the PUD find a long-term profitable scenario, the business is going to lose money in the early years and will have to be subsidized until you get to the needed level of customer penetration.
- Any financing enhancements should be considered. For example, a financing that lets you defer interest payment to later years could really help the business. There are bonds available that have no annual payments, but a balloon note due as a lump sum in future years – this could be attractive if you feel certain of achieving the penetration rates.

The report takes a brief look at the option of the PUD being a retail ISP. That is not allowed currently by law, but it is something that the legislature is considering. The description of the retail business is brief, and the financial analysis is not rigorous – but it's accurate enough to give you a feel for the difference between operating a retail business as contrasted to an open-access business.

Finally, the report makes specific recommendations on the steps that the PUD should undertake after reading and digesting this report.

I. OPEN-ACCESS PHILOSOPHY

A. Overall Philosophy

A Short History of Open Access

Before looking at the specific issues for Jefferson PUD, it's worth opening with a short description of the open-access business model. Anybody reading this report needs to understand the unique nature of open access. Open access refers to the business model where a municipal entity builds a network and then sells access to multiple ISPs. The municipality's only revenue comes from selling access to the various ISPs. ISPs have the relationship with customers and sell, provide services, bill, and provide customer service.

If a Washington PUD wants to offer fiber, broadband, or telecom products or services it is required by Washington law to use only open access. The primary law that dictates the way that the PUD must do business in the fiber business is Washington State Code RCW 54.16.330.[1] See the footnote for the full text of the law.

Here are the important aspects of the law that dictate how the PUD must operate in the telecom business.

- The PUD is allowed to build and own a fiber network and is always allowed to use it for PUD internal purposes, such as connecting electric substations.
- The PUD is prohibited from offering retail telecom services.
- The PUD can sell wholesale telecom services to ISPs, carriers, or other PUDs.
- Any wholesale rates charged must be nondiscriminatory. Many PUDs have interpreted to mean that they have to charge the same rates to everybody.
- A PUD is allowed to create a broadband utility, but even if they don't, they must account for the full costs of providing telecom services including charges like the cost of debt used to construct a fiber network.
- Internally the PUD must charge itself rates that account for the full cost of providing service.
- If an ISP on the wholesale network goes out of business the PUD can step in and take over the customers. However, within 30 days the PUD must begin seeking another ISP to take over the business and customers.

The open-access model thrives in Europe but has had a more difficult time succeeding in the US. Europe has seen success with open-access networks because a significant number of the large ISPs that are willing to operate on a network operated by somebody else. This came about due to the formation of the European Union. Before the European Union, each country on the continent had at least one monopoly telephone company and a monopoly cable TV company. The formation of the European Union resulted in a change in law that opened up existing state-run monopolies to competition. All of the state-owned telecoms and ISPs found themselves in competition with each other and most of these businesses quickly adapted to the competitive environment. This contrasts drastically with the US market where there is no example of any large cable company competing in the same footprint with another and only limited competition between large telephone companies.

[1] A full copy of the statue is at: https://app.leg.wa.gov/rcw/default.aspx?cite=54.16.330

When a few cities in Europe considered the open-access operating model they found more than a dozen major ISPs willing to consider the model (large companies that would be equivalent of getting Comcast, AT&T, or CenturyLink agreeing to use the new fiber network). There are now open-access networks in places like Amsterdam and Paris as well as in hundreds of smaller towns and cities. The biggest networks have over a hundred ISPs competing for customers—many of the ISPs with niche businesses going after a very specific tiny slice of the market. Due to that level of competition, the European fiber networks get practically every customer in their market since even the incumbent providers generally jump to the new fiber network.

Such competition hasn't happened in the US. There are only a handful of examples of the big telcos or cable companies agreeing to serve residential customers on a network owned by somebody else. One such example is underway in Springfield, Missouri where CenturyLink has agreed to operate as the ISP on a network owned by the city. There are also now a few small towns in New Hampshire where Consolidated Communications is operating on networks financed and owned by the town governments. There are no examples yet of the bigger ISPs agreeing to operate in an open-access environment where they compete against other ISPs on the same network.

This means that open-access networks in the US must rely on small ISPs. These small ISPs are generally local and mostly undercapitalized. The small ISPs have all of the problems inherent with small businesses. They often don't have the money or expertise to market well. They often have cash flow issues that put restraints on their growth. In addition, many of them don't last beyond the career of their founder, which is typical of small businesses in general.

It has proven hard for open-access networks in the US to attract multiple ISPs. Consider the example in Chelan County, Washington that today has only two local ISPs that are selling to residential customers. The network originally had almost a dozen ISPs, but over the years the ISPs either folded or were purchased by the remaining ISP. There was a time a few years ago where almost all of the residential business in the network was provided by a single ISP.

A similar thing happened in Provo, Utah before the city sold the network to Google Fiber. The network had originally attracted eight ISPs, but over time they ended up with only two, and those two were considering a merger. It's hard to make an argument that a network with so few choices is open access—because the whole purpose behind open access is to provide customer choice between multiple ISPs.

Examples of Open-Access Networks. Following is a list of some of the other municipal open-access networks in the country.

- The Public Utility Districts (PUDs) in Washington State. These are countywide municipal electric companies. The PUDs are restricted to offering open access due to legislation passed a number of years ago.
- Utah has a similar law that applies to municipalities. This led to the creation of an open-access fiber business in Provo and another network called Utopia that serves a number of small towns. The Provo network was losing a lot of money and the city decided to sell the network to Google Fiber for $1. Utopia seems to financially have reached financial breakeven but went through several messy refinancing deals during its history.
- A similar law was passed in Virginia after Bristol Virginia Utilities (BVU) built a retail fiber network. The legislation grandfathers BVU as a retail provider but only allows other cities to

operate open-access networks. So far, the wholesale model has been adopted by a few cities, the largest being Roanoke, which offers open access on a limited basis to only parts of the city.

- Tacoma, Washington chose an open-access model where the city was the retail provider of cable TV, but connections to the network for telephone and broadband were sold wholesale to ISPs. The city recently exiting the business and leases the entire network to an ISP.
- Ashland, Oregon operates an open-access network, but the city also operates as a retail ISP on the network and competes against a few local ISPs that sell on the network.
- Other communities have tried to build open-access networks but then were unable to find any ISP partners. For example, Longmont, Colorado tried to launch an open-access network, but when they were unable to find ISP partners, they decided to offer full retail services directly to residents.
- There are a number of municipal networks that offer open access on a limited scale. For example, a number of cities have built fiber rings, and are promoting "open access" to carriers. For the most part these networks only service carriers trying to reach larger businesses, cell sites, or schools.

B. Setting Goals for Open Access

My first advice to the PUD is the same that I give to a retail ISP – before thinking about expanding the broadband business, a PUD needs to be able to clearly state the goals for the business. Those goals will normally translate into a philosophy on how to operate the business.

Goals for any broadband business need to be specific if the business is to have a chance to meet them. From working with other ISPs and PUDs, I would suggest that the PUD ought to have specific goals in the following areas. Each of these will be discussed in more detail below.

- Ultimate Goals. What's the ultimate operating model: To bring gigabit broadband for everyone? To be the provider of last resort? To only provide excess capacity where no other provider brings broadband?
- Fiscal Goals. Is the goal to get fiber everywhere or only where it makes financial sense? Is the priority to reach the unserved and underserved regardless of cost, or to build out a network that is economically feasible? Is there a way to blend these goals? Should the PUD consider low-income rates, or premium services? What are the goals for earnings - is the PUD prepared to have operating losses? What's the source, internally and externally, for capital construction funding?
- Goals for ISPs. What are the expected roles and responsibilities for ISPs?
- Operational Goals. What kind of ISP is the PUD seeking? Is there a target market penetration rate? Are there goals for day-to-day activities like those needed for installing a new customer?

Open access is an interesting business model, because the goals in any of the above areas can easily conflict with other goals. For example, if the goal is to always be profitable then it might be hard to justify offering a subsidized product for low-income homes. Following is a discussion of each of the three different sets of goals. Note that I am deliberately avoiding making any recommendations. There really are no good or bad sets of goals, but every goal you set will have specific ramifications on how you operate the business.

Ultimate Goals

If everybody in the PUD and the wider community knows the PUDs broadband goals, it's a lot easier to reach the goals. Following are some ideas for goals that the PUD might want to consider:

Overall Broadband Goals. This asks the big questions of the overall goal for bringing faster broadband. There might be specific goals for:

- Technology. Does the PUD only want to consider fiber or should there also be a wireless component of the wholesale network? If both technologies are to be considered, there should be guidelines defining how to choose between the two.
- Broadband Coverage. Is the goal to bring fast broadband to everybody? Should the focus initially be on rural areas (where coverage is lowest) or urban areas (where costs are lowest)?
- Low-Income Coverage? Does the PUD want to get broadband into low-income households or into every household with students?
- Timeline. For broadband coverage goals to have any teeth, there should be a timeline goal. A goal of bringing broadband to everybody in three years is a drastically different goal than bringing broadband over the next decade.
- Residential versus Business. Are the goals different for residential broadband versus business broadband?

Defining these goals is an important first step for the PUD to take before establishing a pricing philosophy, which is covered in Section I.C below.

Fiscal Goals

Fiscal goals for an open-access network are probably the easiest to set but the hardest to achieve.

Characteristics of ISPs. Before discussing fiscal goals, it's helpful to consider some of the things I've learned from working with other open-access networks that will affect profitability and cash flows:

- ISPs Tend to be Small and Local. No open-access network in the US has attracted a large ISP to operate on an open-access network. This differs from Europe where all the big ISPs jump on available open-access networks. The European experience would be the equivalent of building an open-access network in the US and getting Verizon, CenturyLink, AT&T, Comcast, and Charter on the network as ISPs.

  Instead, the ISPs on US open-access networks tend to be small and local. They tend to be undercapitalized. They are often operated by a sole proprietor or a tiny group of owners. These small ISPs don't have the same sophistication as bigger ISPs. While they are often good technically, they typically don't have the other operating systems that larger successful ISPs use. Small ISPs tend to have small or even nonexistent marketing budgets and often sell by word of mouth.
- Less Competition than Hoped For. One of the supposed biggest benefits of an open-access network is fierce competition between ISPs to get business – but that is rarely seen in the marketplace. If a PUD is lucky enough to get two residential ISPs, they are likely to have similar products and prices and not compete on price. While there may be more competition for business customers, this rarely translates into a price war between small ISPs.
- ISPs Tend to Cherry Pick. ISPs in an open-access network tend to cherry pick, which means they pursue customer with the highest margins. For many ISPs this means only pursuing businesses. For residential ISPs this means mostly pursuing customers willing to buy higher-priced packages

and bundles. This might mean ISPs are not willing to serve parts of a county that involve a long truck roll.

- Small ISPs are not Great at Selling. Not only will small ISPs probably not achieve the hoped-for penetration rates, but they take longer to reach market saturation. Small ISPs tend to have limitations that they'll never admit to a network owner, but such limitations often mean lower and slower sales.
- Retail Rates Tend to be High. ISPs tend to mark-up wholesale connection rates by $25 or more, and most typically more. This means the retail rates for ISPs on your network are not likely going to be competing on price compared to the local cable company. ISPs in an open-access environment typically market on the benefits of fiber.
- Penetration Rates Tend to be Lower. The above two factors together generally mean that open-access networks tend to achieve a lower market penetration compared to a similarly situated retail provider. CCG has hundreds of ISP clients that provide retail services, and my analysis of open-access networks is that overall market penetration rates are at least 10% lower, and sometimes more.
- ISPs Will Not Share Your Customer Service Goals. The PUD likely takes pride in the customer service you provide to power customers. You're likely to see that some of the ISPs on your network will not have the same quality goals as you. It's hard for a network owner to watch an ISP take three days to fix an outage when you would have done it in less than a day.
- ISPs Will Gladly Let the Network Owner Take a Role. Small ISPs will often not perform to your expectations, and if the network owner intervenes and handles things for small ISPs this can become permanent. I've seen a few open-access networks where the owner was performing a significant number of the tasks that I would normally expect to see the ISPs handling.

It's vital to understand the likely behavior of ISPs so that a network owner can set realistic and achievable financial goals. That's easy to say in the abstract, but this will be hard for the PUD since you haven't yet identified the ISPs that might operate on your network.

Cash Flow Goals. I'm discussing cash flow as the first financial parameter, because this is likely going to be your biggest challenge. At the end of this report, I look at specific operating projections, and every open-access scenario I've ever worked with presents cash flow challenges.

There are four specific uses of cash that will present a challenge:

- Construction Capital. Raising the cash needed to build fiber along streets, install electronics huts, and stock core electronics is a major cash outlay.
- Connection Costs. The next biggest cost is the cost of adding a new customer to the network. This requires construction of a fiber drop along with customer electronics.
- Operating Expenses. These are the costs of operating the network. In an open-access network, the largest operating expense is typically the labor for the employees that work on the fiber network and work with the ISPs. Other operating expenses include maintenance and repairs of the network and the expense of supporting employees with vehicles, computers, and similar expenses.
- Financing Costs. Depending upon how a network is funded, payments of interest expense on debt or repayment of principal can be large cash outlays.

Ideally, all of these cash outlays will be funded in some manner. Construction might be funded through bond proceeds, through internal loans from the utility, from grants, from tax revenues, or from operating

revenues. Customer connection might be covered by the same revenue sources, but also could be funded directly by customers or ISPs.

It's a challenge for any new fiber venture to cover costs of expansion quickly. No revenues are generated while a network is under construction, but a new network normally starts accumulating interest expense almost immediately, unless funding comes from a grant. Retail ISPs will tell you that it often takes 3 – 5 years to reach a mature customer saturation in a newly constructed neighborhood – and ISPs understand that there is an operating loss until there are enough customers where incremental new revenues cover incremental new costs. Most businesses are like this – it's no different than building a restaurant and having to wait for several years until the community routinely dines there.

I've generally seen different cash flow goals for different portions of the costs. Most PUDs and ISPs have concrete goals for reaching cash breakeven on operating expenses. It's not unusual when a new broadband business is launched to have a specific goal of having revenues meet and exceed operating expenses within a finite and relatively short period of time.

As the PUD already know, and as is verified from the financial modeling discussed later in this report, cash flow and margins are tight for an open-access business and it's often a big challenge to generate enough revenues to cover the full cost of operations.

The bottom line is that the PUD needs to have goals and a plan for financing these costs. It's likely that finding the money for construction will be a big challenge. In looking around the state at other PUDs, we see different philosophies for how to fund network expansion:

- Jefferson PUD has a unique source of funding available in that you are one of the few PUDs that collects property taxes. It would be possible to allocate some or all of this revenue towards fiber expansion.
- Some PUDs will only expand the network if a significant portion of the expansion is covered by a grant. Several PUDs have won grants in the last few years for this purpose.
- Most PUDs get at least some of the cost of connections from customers and/or ISPs. Most PUDs have a connection fee connection fee to cover some of the costs. PUDs like Pend Oreille set the connection fee to cover the full cost of the drop and the customer ONT. Mason County PUD has set the connection fee at $3,600, which covers both the cost of the customer connections but also covers part of the cost of the underlying network.
- Some PUDs have earmarked "excess" cash from the electric business to go to fiber. This was the policy for many years at Chelan County PUD. The PUD Board decided that electric reserves were adequate, and that new excess cash would be used to fund fiber. This meant that there were years with no fiber expansion, and a few years when multiple millions were used for fiber construction.
- Some PUDs have extended formal internal loans to pay for fiber expansion. These loans are most normally made from cash reserves, and the PUD fully expects the loans to be repaid. We've seen the interest rate on internal loans range between a small rate that represented the rate at which investments in reserves could be earned elsewhere, up to market rates that were set to equal the most current bond rates.
- It's also possible to purposefully subsidize a fiber network. A few PUDs have purposefully built some of the cost of the fiber network into higher electric rates, meaning there is no internal loan and no intention of repaying the investment.

- A few municipal networks have gone through a formal process of allocating the cost of a fiber network between the electric utility and the fiber business. Fiber networks are typically used to connect to substations and other electric facilities and the reasoning is that the electric utility ought to pay for its portion of the network. This results in a set of books where the fiber asset is split between two entities, though another solution is to put the entire fiber network on the books of only one entity and bill the other internal utility for using the network.
- I don't know of any PUDs that have funded fiber directly with a bond issue – but that is a routine way for municipalities building a retail network to fund the construction.

Once the public knows that the PUD is interested in expanding a fiber network, they will want to know how it's being paid for and when fiber is coming to their neighborhood. We expect the PUD will want to explicitly choose one or more of the above funding philosophies to describe how the PUD will expand the fiber network.

Profitability Goals. Profitability is different than cash flow, and some PUDs and municipal retail ISPs measure success using some form of a profitability calculation.

Here are a few ways how profitability can be different than cash flow:

- Profitability does not consider money spent in a given year to build network assets. Such costs, such as constructing fiber or buying a new cherry-picker, would be capitalized as an asset.
- Profitability calculations might instead include depreciation and amortization of assets. These are the costs of recognizing and writing off an asset over time. For example, a fiber network might be depreciated over 30 years, in which cash the books in each of the thirty years will get hit with one-thirtieth of the cost of the asset. Depreciation is not a cash expense – it recognizes a deferred expense from an asset that was built in the past.
- Profitability calculation would not normally recognize repayment of loan or bond principal. Just like with a home mortgage, a principal payment reflects a reduction in the debt that is still owed, but it is not recognized in the accounting world as an expense.
- Some PUDs and municipalities exclude some internal allocations when calculating profitability. Otherwise, then end up adding an expected return component on top of internally generated expenses. I've seen municipalities that exclude all internal accounting transactions from a return calculation – again, the reason that they don't need to add a "profit" on top of a broadband product sold internally to the electric utility.
- Profitability calculations sometimes include theoretical taxes or fees. For example, some municipal utilities pay In Lieu of Taxes (ILOT) to the government and include ILOT in any profitability calculation, even if the particular entity involved is not paying ILOT.
- Profitability calculations can get complicated. As an example, a PUD might have a goal for earning some target return on PUD equity each year. If a PUD expected to make a return, such as 5%, then an earnings goal for fiber might also include an assumption that fiber should be covering the expected return over and above covering operating expenses.

Measuring Success. It is possible for the PUD Board to establish an earnings goal for the fiber business. We know municipal businesses that establish both cash flow and profitability goals for the fiber business. In such case, the fiber business would be expected to meet both goals.

It can be challenging to set a profitability goal if profitability is defined to be drastically different than cash flow. We know one PUD that decided that all components of the business should individually meet the overall PUD earnings goal. They reasoned that if each part of the business reached the overall goal that the PUD, by definition, would achieve the overall earnings goal for the year.

The problem with this concept in this particular case is that the only entity in the PUD that was making money was the electric utility (at least making money in a way that satisfied the profitability test). The water utility, the fiber business, and the parks did not meet the profitability metrics (and never had). The PUD spent several years chasing this bad concept by trying to improve the performance of the underperforming parts of the business – to no avail. The parks were never intended to be profitable. Water rates had been set deliberately low and the Board and public had no appetite for raising water rates enough to meet an earnings goal formula. Fiber generated positive cash but failed the earnings test due to the high depreciation that always comes in the first 10 years of a capital-intensive business. The fact was that the electric utility had always outperformed the goals and had covered the shortfalls of the other businesses. The PUD finally got realistic and formally recognized what it had already known for decades.

Goals for ISPs

The second set of PUD goals relates to the PUD's goals for ISP partners. This report looks in more detail at this issue in Section V below. The PUD might want to consider the following types of goals for ISPs:

Types of ISPs. Some of the PUDs in the state mostly work with ISPs that focus on business customers. This is the easiest type of ISP to attract because there are likely already computer and IT technology consultants in the community that work with businesses, and we've seen PUDs convince such entities to become ISPs and bundle telecom products in with their other services. These types of businesses can often become ISPs without hiring new staff.

It's a lot harder to find residential ISPs. Any ISP that enters the residential market needs to have systems in place to market, bill, and serve significant numbers of residential customers. Ideally a PUD ought to have at least two residential ISPs in order to have any competition in the market.

PUDs often also sell to carriers. This could be somebody like NoaNet or Zayo which then sell connectivity to other carriers, or PUDs might forge relationships directly with cellular carriers, telephone companies, etc.

There are also "carriers" that are in a gray area, but some PUDs sell connectivity directly to large entities such as data center owners like Microsoft or Facebook. Those large entities are not traditional carriers, but are likely seeking traditional carrier products, which are easily distinguishable from retail ISP services.

Qualifying ISPs. Some PUDs have a formal process of vetting and approving new ISPs. They want to make sure that the companies are technically savvy enough to be ISPs and are financially solvent enough to pay the access fees to the PUD. There are PUDs that require cash deposits from new ISPs until a new entity has proved the ability to pay PUD access fees.

Market Penetration Rate. Most PUDs have a market penetration goal, but since PUDs don't directly sell retail products, any such goals become goals for the ISPs to reach. This is the most challenging goal for

an open-access network owner since there is no direct interface with retail customers. But there are ways for the PUDs to push ISPs to perform.

- We know of PUDs that require periodic marketing forecasts from ISPs. A PUD needs to understand the marketing goals for the ISPs to make sure that the PUD has sufficient staffing and funding to add new customers.
- We've also seen PUDs work closely with ISPs during major marketing promotions. While PUDs don't sell directly to end-users, the PUDs are likely installing drops and electronics for customers and the PUD should be kept in the loop for any periodic push for new customers.
- We've also seen open-access network owners directly market to the public. Such advertising is generally aimed at letting the public know that fiber broadband is available at their home or business. This report looks closer at this topic in Section V.B.

ISP Quality of Service. Some PUDs have established operational / quality of service goals for ISPs on the network. This could include a wide range of issues related to making sure that end-user customers receive quality service. Some typical requirements might include such things as:

- In-Market Technical Staff. ISPs might be expected to have technical staff in market (employees or contractual arrangements) to be able to respond to outages and problems.
- Installation Queue. Most open-access network providers set a goal of getting new customers installed within some set number of days after an ISP takes a customer order.
- Response to Customer Troubles. ISPs are expected to solve customer outages and other problems within defined time frames.
- Fair Billing Practices. It's not unusual for an open-access network owner to insist that ISPs fairly bill customers with no deceptional billing rates or practices.
- Network Safety Requirements. ISPs are generally required to agree to terminate customers that engage in practices that can endanger the network such as promulgating viruses or allowing customers to traffic in illegal content.

Ownership of the Network. The PUD could establish a "dark network" and could require that ISPs pay for and own all electronics at the customer location. ISPs would be required to use electronics approved by the PUD.

This concept can make for future complications. For example, would this require a swap of electronics when a customer changes ISP? Would the PUD be able to force ISPs to migrate and upgrade electronics in the future?

The upside to this concept from an operational perspective is that the ISPs control the connection to the customer, and this eliminates the PUD from repair and maintenance issues that are not wire-related.

Defining ISP versus PUC Responsibilities. One of the issues I've heard from all open-access owners is that there is a tug of war between ISPs and the network owner about which entity should make a truck roll when there is a customer problem. Truck rolls cost money and eat up technician time and ISPs will try to get the PUD to make the first truck roll if they are able to do so. In practice, ISPs should deal with issues inside of a customer premise and the PUD should deal with issues in the fiber network, in the drop, or with the fiber electronics. Unfortunately, when there is a customer problem it's not always easy to know the cause of a problem.

Operational Goals

The PUD also needs to have internal operational goals similar to the goals you set for ISPs. These may include such things as:

- Installation Queue. The PUD should have internal goals for the length of time required to install a new customer.
- Response to Customer Troubles. The PUD should also have internal goals for the time spent responding to different types of customer problems.
- Finding Broadband Grants. In today's world where there are numerous and continuing state and federal broadband grants, the PUD should establish a specific goal for finding and applying for grants to build new network. Without a priority on the topic, you'll miss opportunities.

C. Pricing Philosophy

Setting prices in an open-access environment isn't easy. Ideally, the PUD's pricing philosophy will match the goals discussed above. For example, if one of the primary goals is to get broadband to as many homes as possible in the community, then low access fees are almost a must. But coverage goals also have to weighed against fiscal goals.

There are a number of different pricing philosophies that the PUD can consider. It's possible for a pricing philosophy to include more than one of these ideas.

Impact of Open-Access Rates on Retail Rates. In looking at the various ISPs operating on an open-access network, we conclude that ISPs tend set retail rates from $25 to $35 above the open-access rates. This means that a PUD has a direct role in establishing the retail rates on an open-access network.

We've also seen that ISPs pass along any rate increases directly to customers. If a PUD raises rates $3, then within a short time the ISPs are likely to also raise rates by the same amount and tell customers that the increase is due to the PUD.

To some degree, this means that a PUD needs to work cooperatively with residential ISPs. Unfortunately, a PUD has no power or authority in setting retail rates, but over time it's important for PUDs to work closely with ISPs and get feedback before raising rates.

Low Access Rates. The PUD could charge low access rates to try to hold down broadband retail rates and make fiber available to more households. Almost by definition, low access rates are going to push the PUD to pursue a high customer penetration rate in order to drive enough revenue.

The opposite of this approach is to set access rates high, meaning that customers pay a premium price to get onto the fiber network.

Low-Income Rates. Any rate philosophy could include the principle of setting lower access rates for ISPs that are willing to pass on the savings to serve qualified low-income families.

Connection Fee Philosophy. There is a wide range of ways for the PUD to be compensated for the cost of connection customers to the network. This is discussed in detail in Section III.C.

Differentiated Rates. The access rate designs can recognize different market and financial goals of the PUD, and the rates don't need to be the same for every broadband customer. Some of these concepts are explored in the financial analysis in Section IV

- The PUD could charge significantly different rates for residential versus business customers.
- The access rates can vary by the allowed speed of the broadband connection. For example, there could be a higher fee for a gigabit connection than for a 100 Mbps connection.
- Some PUDs charge extra according to services other than broadband that are delivered to customers. For example, there are PUDs that charge extra to deliver cable TV signal or telephone service. This concept is somewhat obsolete today. Originally, the cost of the customer ONT electronics was significantly different for the ability to carry these extra services. Today, it's likely that an ISP that delivers cable TV or telephone service would do so digitally and wouldn't require a more expensive ONT.

One of the primary recommendations made in the study is for the PUD to adopt a rate philosophy and rates. Any decision of how to set rates needs to consider all of the issues described in this section of the report. But rates also need to meet financial goals and must make sense according to the financial feasibility results discussed in Section IV.

You're going to find that setting open-access rates is the most challenging part of expanding the fiber network. If rates are too high, then you'll not achieve the customer penetration rate needed to make the business work. If rates are too low, the network will attract more customers and still not achieve the needed revenue stream. It's going to a huge problem trying to set rates that promote broadband in low-income homes.

II. RESPONSIBILITIES OF THE PUD AND ISPS

The report so far has talked about setting open-access rates, which is an important aspect of working with ISPs. But there are numerous operational interfaces between a PUD and ISPs, and it's vital that the PUD establish the rules and processes for each step of working with ISPs.

This is a good place to repeat something that was said earlier – the ISPs that will be working on an open-access network tend to be small, local, undercapitalized, and sometimes somewhat naïve or unprepared to deal with all of the aspects of being a retail ISP. In talking with a number of PUDs, we've learned that many ISPs are willing to cede responsibilities to the PUD if the PUD allows them. This makes it vital to clearly define the specific roles and responsibilities of both the PUD and the ISPs before you start working with ISPs.

This section of the report is going to discuss the many operational and related interfaces between the two parties. I'm ordering the topics in the same order that comes with the process of connecting a new customer, up through the point of taking care of customers after connection. There are important interfaces, policies, and procedures at each of these steps.

Qualifying ISPs

One of the most important steps when working with a new ISP is deciding if the PUD is going to allow the ISP onto the network. The other PUDs all go through a qualifying process, which tells me that PUDs have the authority to make sure that ISPs are capable of being in the retail business and that ISPs are going to be capable of paying the PUD and continuing to service customers. Following are some of the types of qualifications that other open-access providers have required of a new ISP. Anecdotally, many of these same requirements are also expected of carriers that want to collocate and interconnect with other carriers.

Business Qualification. It's important to verify that an ISP has a valid business license and is in good standing with state and local registrations and licenses. It would not be unusual to make sure that the business owners are not guilty of felonies and that the business is not currently engaged in any major lawsuits.

Financial Capability. One of the primary concerns of a PUD is that an ISP will pay for use of the network on a timely basis. Most financial qualifications required by network owners are aimed at that assurance.

There is no easy way to judge the financial viability of an ISP. A municipality probably does not want to put itself into the situation of examining the books of a potential ISP and somehow passing judgement based upon accounting records. ISPs are also going to highly skeptical of providing books and ledgers to a public entity that might then make the records public. For example, it probably makes no sense for a PUD to insist that an ISP have audited books unless the books will be required and somehow reviewed.

Most PUDs and other carriers address financial viability be requiring a deposit. For example, it would not be unusual to demand a deposit equal to the expected monthly billings of an ISP. This kind of policy might mean that as the ISP grows that the size of the deposit grows.

If a PUD takes a deposit it must be made clear how the deposit can be used. For example, a deposit might be used to cover a payment shortage of an ISP for covering monthly usage for wholesale services. But it probably could be used for other purposes like to cover capital contributions.

PUDs must wrestle with the issue of consistency and discrimination. For example, if there is a deposit for a local ISP, would the same rules apply to publicly traded ISPs like CenturyLink? Would the deposit apply to large private companies like NoaNet or Zayo? Most PUDs determine deposits on an ad hoc and case-by-case basis. Often, ISPs who pay on time over a long time period might be able to reduce or eliminate the deposit. ISPs that have trouble paying might be asked to increase the deposit. But any such policies need to be reviewed by PUD legal counsel.

It also seems sensible to require that ISPs notify the PUDs of any material changes in their financial status. For example, they should be required to notify in the case of a bankruptcy, or perhaps in the case of a material lawsuit against them seeking financial damages.

Another normal requirement would be that an ISP must carry specified levels of insurance before being allowed to use the network. The insurance would generally be in place to cover instances where the ISP or its employees damage the network or in some way cause harm to the PUD. Insurance would not be expected to cover non-payment of monthly invoices.

Operational Capability. It makes sense to somehow verify that an ISP has the technical and operational capacity to operate properly on the network. Like with financial viability, this may not always be the easiest thing to describe – but you know it when you see it. Most state regulatory bodies have a similar requirement for any company that wants to be certified as a carrier. Some of the ideas for verifying operational capability:

- An ISP ought to provide resumes of key employees that demonstrate relevant industry experience.
- An ISP might be asked to have at least one technician that has attended the vendor training for the brand of fiber electronics used at the customer location.
- An ISP might be asked to promise that it will have in-market employees and technicians capable of making repairs in a timely manner. This doesn't necessarily have to be employees, and an ISP could have a contractual arrangement with local technicians or perhaps with another ISP in the area.
- An ISP may be asked to verify that they already have the capability to bills and collect fees from customers. ISPs might be asked to verify that they have experience in collecting taxes from customers and properly remitting taxes to taxing authorities.

Regulatory Compliance. There are very few regulations that apply to a wholesale network owner. However, there are numerous state and federal regulations that apply to retail ISPs. There are separate regulatory requirements for providing broadband, telephone, or cable TV service.

It seems reasonable to ask ISPs to swear that they will comply with all relevant regulatory requirements. This is an important requirement because numerous small ISPs do not adhere to many regulations. But regulations are largely in place to protect end-user customers, so it seems reasonable that a PUD would expect each ISP to be current in complying with all regulations. This infers not only verifying regulatory compliance to get on the network but confirming annually that the ISP is still in compliance. It wouldn't

be unreasonable for the annual confirmation to specifically list the specific regulatory requirements using some kind of checklist.

This is an interesting requirement, though, since some of the larger telcos are often not complying fully with all regulations. This again begs the questions of applying this requirement equally to all ISPs.

Policy Compliance. There is a long list of policies that a PUD will want any ISP to adhere to. A complete list might be several pages long. This would include items like:

- An ISP will adhere to practices that protect network safety and integrity such as working to block viruses and other destructive web practices.
- Adhering to PUD safety practices when working at PUD locations or at customer premises. In this year of pandemic this might also include a guarantee that technicians are following pandemic safety precautions.
- ISPs should agree to quickly terminate customers that use the web in illegal manners such as engaging in spam, operating an illegal robocalling platform, etc.
- ISPs must be willing to comply with legal requirements such as court-ordered wiretaps or lawful requests from law enforcement asking for customer records.
- ISPs should never connect unlawful equipment to the network such as network devices that are not approved by the FCC. Currently such a list would include certain Chinese electronics.
- ISPs should attest that they won't knowingly damage or cause harm to any PUD electronics or network.
- ISPs should agree not to discriminate against customers on the basis of race, sex, or whatever is the standard at the time.
- ISPs should agree to not engage in deceptive or illegal billing practices with customers.

Physical Interface with the ISP

The PUD can dictate the method in which ISPs interconnect with the PUD fiber network. Some options include:

- An ISP can be required to collocate in PUD space such that the interface is made with your hub.
- An ISP can be allowed to interface at any convenient hut in the market.
- An ISP could instead be required to buy a transport product at normal PUD pricing to connect back its hub. ISPs can be required to maintain a large enough data connection such that customer traffic doesn't get choked.

Joint Marketing

If the PUD is going to engage in any marketing of broadband, the effort needs to be made in a highly coordinated effort with the ISPs. It does no good to create customer interest in fiber broadband if ISPs aren't poised to close sales leads.

Connecting a New Customer

There should be a well-defined and easy to use set of processes between ISPs and the PUDs for receiving and implementing end-user orders for service.

Budget Limitations. Many PUDs have budgetary limits on capital spending in a given year, and in many cases, this has translated into some hard limit on the number of new customers that can be connected in a given month, quarter, or year. Should the PUD reach these kinds of limits it's vital to communicate clearly with ISPs so that connections are not sold to customers that cannot be fulfilled.

This also raises policy issues about how to handle backlogged customer requests. For example, should an ISP be able to reserve installation openings for the following time period? Does each ISP get some number of installation opportunities or is it first come, first served?

Ordering Portal. The tool that makes the most sense for the ordering process is some kind of ordering portal. This would be open to the PUD and to ISPs to input important facts. The portal might be where an ISP places the initial order. Each party would then enter completion status for each step of the ordering process, up through the hand-off of the new service to an end-user customer. Ideally, a portal is interactive and notifies parties as steps are completed to notify when the next step should be tackled and completed.

Without a good portal some orders invariably fall through the cracks, which can result in customers that cancel orders that are half completed.

Customer Approval Process. It's somewhat normal for PUDs and/or ISPs to require some level of approval for a new customer. This might include the following:

- Application Form. A PUD might require a formal application for each potential new customer. This would define the customer name and address and would define if a drop and/or electronics are already in place at the customer.
- Credit Checks. Many ISPs undertake a credit check before building a fiber drop to a new customer. If the PUD wants to implement a credit check then the process for doing so must be defined with ISPs.
- Deposits. PUDs and or ISPs might require a cash deposit from customers before building a new drop. Any such deposits need to comply with state laws. Deposits are usually not open-ended, and customer should be notified how and when deposits will be returned to them.

Connection Fees. If the customer is going to be asked to pay for some or all of the drop cost, there must be a process in place for making this work. If the drop fee is standard and not based upon the actual cost of the drop, then this just requires a notification that a pre-payment of the drop fee is needed before an order is processed. But if a customer is to pay a fee based upon the actual cost of the drop, then it is incumbent on the PUD to quickly visit the location and make an estimate of the drop cost.

The connection fee might be the only point in an interaction with customers where the PUD will interface directly with the customer. The PUD might want to be paid directly for installation fees and not want the fees passed through the ISP. The PUD should create whatever paperwork or contracts it feels are needed for these transactions with customers.

Making the Customer Connection. The PUD is likely going to be responsible for constructing the fiber drop and installing and testing the customer electronics.

- Rights-of-Way / Easement. If a drop is to be constructed, a customer will need to execute an easement approval before construction can be done. If the customer is renting the property, local laws or PUD policy might require that the easement be signed by the property owner.

- Construction Timeline. The number one complaint I've heard from ISPs in an open-access environment is that PUDs don't meet time commitments for installing new customers. ISPs universally say that it's vital that they be able to give customers an accurate estimate of the date of service when making a sale, so it's important for the PUD and ISPs to each meet their expected times to complete various tasks that are part of the installation process.
- Demarcation Point. For every customer there should be a clearly defined demarcation point where the PUD owns all assets on one side of the demarcation and the ISP and/or customer owns everything on the other side. For residential customers in single family homes the demarcation is generally the same for all customers. It can be more complicated with residents of apartment buildings. The demarcation for business customer can vary significantly, so there should always be a document generated that defines the demarcation for each business customer.
- Testing. There should be a formal testing process where the ISP accepts that the connection is valid and meets specifications.

Provisioning. Provisioning is the process of making sure that customers are provided the products they have purchased. In an open-access environment, the provisioning for the PUD mostly consists of verifying that a connection is working and that the proper broadband speed has been activated. Provisioning of other products like telephone service or cable TV would be the responsibility of the ISP.

Activation. Some PUDs have an activation event. This would be a notification provided to an ISP that the connection is live and working and that billing for the connection will commence.

Temporary Service. PUDs are invariably asked from time to time to activate temporary connections. This might be a connection made to support an annual community event, or a campaign event or some other non-permanent connection. The PUD should create a rate structure for temporary connections.

Billing for a Connection

Billing Cycles. The PUD needs to determine the billing cycle(s). You can bill once a month, twice per month, or once per week. If you bill more than once per month, you need to make sure that ISPs know which customers are on which cycle.

Billing In-front or in Arrears. The industry is somewhat split on the idea of billing in-front (billing for a month of service before it happens) or billing in arrears (billing after the month has completed). Billing in-front is far better for cash flow, but you'll have to adjust for any charges that turn out different than you billed.

Billing Process. There are PUDs who bill using simple spreadsheets to detail the billing. It's also possible to use more sophisticated software intended for billing. Many of the features in such software are not needed in a wholesale bill when the ISP likely pays the whole bill at once for most customers. But the downside to not using more sophisticated billing software is that errors will creep into the billing. For example, if a connection gets left out of a spreadsheet bill, you might never bill for it.

ISP Nonpayment. PUDs say that late payment from ISPs is one of the biggest problems in an open-access environment. The PUD must have clear expectations and formal policies about when ISPs should pay. As discussed above, there might be a deposit required for ISPs that don't pay in a timely manner.

Other Issues with ISP Payments. The PUD should have clearly stated policies for expected billing situations:

- Customer Nonpayment. What happens if an end user customer doesn't pay the ISP? Most wholesale situations still expect to bill and collet for the connection.
- Partial Payments. Similarly, what happens if an end-user customer makes a partial payment to the ISP?
- Seasonal Rates. Will the PUD have seasonal rates for customers that are only in the market for part of the year? If so, how does that jive with ISP billing practices?
- Disconnection. How will the PUD modify billing if a customer is suspended or disconnected for nonpayment? Is there a nonrecurring charge to suspend or renew billing during this situation? How does the PUD participate in this process to cut-off and restore service?
- Credits for Outages. There must be policies in place to provide credits to ISPs for times when there are major outages. For instance, if a fiber feeding a neighborhood is badly damaged in a storm it could be a week until service is restored. The policies should be in place so that the ISP and customers know what to expect in such circumstances. There also must be some easy method in place to apply any billing credits.

Network Maintenance

The PUD already monitors your own network. What must be established is the degree to which ISPs are allowed to participate monitoring the network and the processes needed to allow such participation.

Alarms. Networks are equipped with alarms. These are notices that are automatically generated when something goes wrong in the network. An alarm might be something minor, such as notifying you if the temperature goes above average in a hut, or could be major, such as with a fiber cut.

The PUD must have a process in place to monitor and react to alarms. Alarms are generally categorized in ways that directs the level of needed response. Minor alarms might be investigated later. Major alarms might get everybody out of bed.

The PUD needs to decide how to let the ISPs into the alarm process. Most PUDs don't show every alarm to PUDs. For example, PUDs might not share the large quantities of minor alarms which might be untroublesome and routine. ISPs should definitely get notified of any situation that means a customer is out of service, or where a customer is likely to lose service.

Ideally there is some type of portal for the alarm and repair process that is used to notify ISPs and also that would show the real-time status when problems are fixed. To the extent that ISPs must take a role in clearing problems (such as when the problem is inside the customer premise), then the ISP should also be able to note when problems have been cleared.

There is generally a well-defined process for monitoring alarms. At any given time, at least one person at the PUD would be responsible for monitoring and reacting to alarms. This is often done in a NOC (network operations center), but it can be done in many other ways. The function can be outsourced (a few PUDs use NoaNet or other external vendors for this function).

Escalation. This is the process where technicians, management, or the ISPs are notified about problems. Escalation can be as simple for many issues as sending an email to the appropriate parties. Bigger issues are often escalated by a required telephone call to various parties. Escalation might also involve notifying the customer in some manner by text or some other method that doesn't rely on the broadband connection.

One aspect of escalation is that the response to a problem varies by time of day. When problems arise during the workday it's generally easy to notify the ISP of problems. This becomes more of a challenge on evenings and weekends.

Dispatch. Dispatch is the process of assigning the responsibility for a network problem to specific individuals. For a large percentage of alarms, the technician monitoring the alarms will be able to clear the problem using network tools.

There is a lot of controversy at PUDs over the issue of allowing the ISPs to participate in the process of fixing problems remotely. The problem is due to the fact that the network is divided between the two parties. The PUD owns and can remotely repair the customer ONT and other fiber network electronics. The ISP will have access to electronics inside the home such as WiFi routers. Ideally both the PUD and the ISPs will agree to allow technicians to peer to see the portion of the network owned by the other party. This would allow a technician from either party to identify a problem – which is key to avoid excess truck rolls by both parties.

That can only be made to work if ISPs are allowed to "peer" into the network and to effectuate changes to electronics or software settings to clear a problem. ISPs always want the ability to do this, because it saves money whenever a problem can be cleared without having to send a technician in a truck.

But the downside to providing access to ISP technicians is that they might be able to make unauthorized changes. If they have enough access to see into the network and ping devices, they also probably can change settings or otherwise affect the network. Any system developed to give access to ISPs would have to have iron-tight security to limit what ISP technicians can do – but not so strict that they can't fix problems. There is no easy answer to this issue.

But sometimes, somebody needs to roll a truck to investigate the issue. This is an area of controversy in an open-access network because no technician can handle all problems. The PUD can deal with problems outside the home and the ISP technician can deal with problems inside the home. Unfortunately, it's sometimes impossible to diagnose a problem until somebody travels to the customer and looks or tests the network.

This means in an open-access environment that the wrong technician is sometimes dispatched to a customer. That's costly since it means both parties probably will have a technician at the site to fix the problem. We know from experience that ISPs will work hard to get the PUD to make the first truck roll – and they won't want to pay for that truck roll if it turns out that the problem was the ISP's.

I don't think any PUD has fully solved this problem – it's an inherent aspect of an open-access network where the customer network is split between the PUD and the ISP.

Customer Upgrade Procedures. The PUD and the ISP must establish a set of procedures for making customer upgrades. Such upgrades might be simple, such as changing the broadband speed. But even simple changes should be coordinated.

More complex upgrades might require swapping of customer equipment or moving the fiber drop. It's important that both parties know about such changes even if they don't participate – so that no unneeded alarms and escalation are triggered.

System Testing and Upgrade Procedures. The PUD will periodically have to take parts of the network out of service to upgrade hardware or software, and that means that customers will be out of service during the testing or upgrade event. These processes are almost always done late at night to disrupt the fewest number of customers – but it invariably affects somebody.

There should be notifications made to the ISPs well in advance of network maintenance so that they can notify affected customers.

Network Outages. Many fiber utilities have online maps that describe network outages – many utilities have similar systems for electric outages. The PUD and ISPs need to coordinate how this will work.

Customer Troubles

Taking Customer Calls / Trouble Tickets. This topic was already touched upon under the topic of alar monitoring. Alarms are a major way for the PUD to find out about troubles. But trouble reports can also come from customer contacts through phone calls, emails, text messages, or a web portal.

Regardless of the source of a trouble report, there must be clear processes in place for logging outages and problems from the various sources, and then making repairs in a timely manner. It's normal for a PUD and ISPs to establish mutual goals for repair times. For instance, the goal for some simple repairs might be to clear the issue the same, or the following day. Major outages generally require all hands on deck to work until the problem is solved.

Most network owners keep a running list of all network issues. Technicians are expected to clear issues to get them off the list. For example, it's not unusual for somebody monitoring the network at night to clear the minor alarms generated during the day.

Guaranteed Response Times. There might be circumstances where the PUD guarantees response times. For example, this report discusses charging a fee to retail customers for expedited repair service. Customers paying extra for this would expect even minor problems to be solved as quickly as practical.

It's also likely that the PUD will have contracts with some large customers like cellular sites, data centers, or important businesses that have defined repair goals, along with monetary damages for not repairing problems quickly enough.

Resolving Disputes

There needs to be a written process in place that defines how the PUD and ISPs will resolve disputes. Disputes could be about any of the topics discussed above, from network issues to billing issues. Most arrangements have an escalating process something like the following:

- Management of both parties will meet to negotiate resolution of issues. This would be the expected method to clear most issues. This might be done in several tiers, with operational staff first trying to solve disputes, followed by upper management.
- Non-binding mediation is usually the next step since it's the most cost-effective way to resolve disputes. An industry expert is hired to hear both sides and to offer a suggested settlement. Such suggestions are not binding, but the process is pretty effective.
- Binding arbitration. This is a much more expensive process that sends an issue to a judge who may hire needed experts to assist. The parties must agree to the results of binding arbitration.
- The alternative to binding arbitration is a lawsuit, which is generally the most expensive way to resolve disputes. A PUD and an ISP would have to be at major loggerheads to have a dispute end up in court.

The fact that resolving disputes can be expensive is why it's important to get as many of the policies and procedures discussed in this section in writing. It's also important that processes and procedures are explained to a new ISP and that the ISP be required to acknowledge that they've been told about processes before they are allowed to connect to customers.

As an aside, ISPs quickly figure out that PUDs are a political entity and will try to take end runs to resolve problem by escalating issues to PUD management or the Board. I caution the PUD to work against allowing that to happen.

Summary

The PUD needs to work out policies and processes for the many different items listed above in this section. Some of these are already in place, but before launching any major effort towards open access, even existing policies should be reexamined.

III. OPEN-ACCESS RATES

This section will examine different options for developing open-access rates and also look at the existing rates of other PUDs in the state.

A. Residential Open-Access Rates

Residential Open-Access Products

Most open-access networks charge a rate to cover the cost of a fiber connection to a residential customer. PUDs generally label this fee as a loop rate or an access fee. The term loop is a telecom term used to describe the last mile network built to reach customers.

We've seen residential loop rates set in the following ways:

- Flat Rate. This a loop fee set per connection and that doesn't vary according to the amount of bandwidth being delivered.
- Bandwidth Price Differential. Some PUDs charge more for faster connections. For example, the fee might be different for a 100 Mbps connection, a 500 Mbps connection, and a gigabit connection.
- Technology Difference. It's not unusual to have different rates for different types of technology. A common example would be a different loop rate for supporting a PUD-owned fixed wireless network connection.
- Added Features. Some PUDs charge more for adding additional features:
    - Cable TV / Telephone Additive. This fee would be added if the PUD is asked to specially bridge service for these products. This fee harkens back to earlier technology where there was a more expensive ONT needed to provide video or voice.
    - Premium Service. PUDs might define premium in different ways. The most common would be that a customer that pays the premium rate can get repairs done in the evenings or weekends rather than just during the normal work hours.
- Connection Fees. PUDs often charge a connection fee to add a customer to the network. This could be billed directly to the customer pr passed through the ISP.
- Construction Fees. It's not unusual for PUDs to charge a fee to cover some or all of the cost of building the fiber connection to add a new customer.
- Truck Roll Fee. PUDs often charge extra for sending a truck on a repair call, particularly if the problem was not with the PUD network but was inside the customer premise.
- Internet Bandwidth Charge. Some PUDs sell wholesale Internet bandwidth to ISPs while other require an ISP to obtain its own Internet connection.

Following are open-access fees charged by some other Washington PUDs

Mason County PUD District 3

Standard Connection

Non-Recurring Charges (To customer)

Standard Connection Fee	$ 25
Construction Application Fee	$100

- The standard fee is charged to every new customer.
- The $100 construction fee is charged to a new customer who lives in an area that already has fiber. This is a non-refundable fee for having the PUD estimate the cost of the connection.
- The PUD also reserves the right to ask a new customer to pay for the entire cost of constructing a connection.

Monthly Fee (to ISP)

Fiber Connection to 1 Gbps	$ 35
Fiber Low-Income Customer	$ 25
Wireless Connection	$ 25
Low-Income Wireless Connection	$ 15
Video / Phone port	$1.50

Truck Roll Fees

After Hours Visit Fee	$ 10
Non-network Related Fee (normal business hours)	$150
Non-network Related Fee (after hours)	$250

- The visit fee is charged after normal business hours if the reason for the technician visit was related to the PUD's network.
- The non-network related fee is charged to the ISP if the PUD has to make a truck roll for an issue that is not related to the PUD network (outside the demarcation point).

<u>Fiberhood Connection</u>

Mason PUD 3 has an interesting platform it calls Fiberhood. The PUD will build fiber to a neighborhood if enough homes in the neighborhood agree to pay a $3,500 fee to get connected to the fiber. The PUD reserves the right to decide to accept a neighborhood request. While customers could pay this fee upfront, the PUD is prepared to amortize as a monthly fee the fee over 12 years. The fee ceases once the connection fee has been collected by the PUD.

Fiberhood Charges (to Customer)

Fiberhood Construction Application Charge	$300
Fiberhood Monthly Fee (12 years)	$ 25

- The fees charge to ISP are the same as standard connections.

Clallam County PUD

<u>Standard Connection</u>

Non-Recurring Charges (To ISP)

Standard Connection Fee	$100

- The standard fee is charged to every new customer.

Monthly Fee (to ISP)

Fiber Connection 10 Mbps	$ 25
Fiber Connection 100 Mbps	$ 50
Fiber Connection 1 Gbps	$ 75
Multiservice Port 1 Gbps	$100
Multiservice Port 10 Gbps	$175

- A Multiservice port is required for a location that connects more than one premise at the same location, such as an apartment building.

Grays Harbor PUD

Business Connections Only

Douglas County PUD

Non-Recurring Charges (To ISP)

Standard Connection Fee	$150

- The standard fee is charged to every new customer.

Monthly Fee (to ISP)

Fiber Connection 100 Mbps	$ 27
Fiber Connection 1 Gbps	$ 54

- The PUD offers a 50% discount for an apartment building that has at least four connections.
- The PUD offers to provide the Internet bandwidth for a fee.
- The PUD offers a full range of wholesale cable TV programming from a headend owned and operated by the PUD.

Grant County PUD

Monthly Fee (to ISP)

Basic Access 100 Mbps	$ 29
Premium Access	$ 39
Gigabit Access	$ 65
Wireless Access	$ 26
Video Port	$1.50
Voice Port	$ 5

- The PUD has no non-recurring fees.
- Premium access provides priority restoration after outages. The gigabit connection includes priority service.

Chelan County PUD

Non-Recurring Charges (To ISP)

Standard Connection Fee	$ 0

- The PUD reserves the right to charge a fee, but it is often zero.

Monthly Fee (to ISP)

Basic Access 100 Mbps	$ 12
Basic Access 1 Gbps	$ 15
Data Usage Rate	Varies

- The full PUD charge combines a basic access rate and a data usage rate. The data usage rate is determined by a formula that compares actual usage to forecasted usage. The usage fee is based upon the total usage of the ISP and not on a specific customer. The combination of the two rates is intended to collect roughly $27 for a 100 Mbps loop and $33 for a gigabit loop.

Pend Oreille County PUD

Non-Recurring Charges (To ISP)

Wireless Connection Fee	$200
Fiber Connection Fee	$ Actual Installation Cost

- The PUD charges the actual cost of the fiber drop and the electronics. This typically varies between $1,200 and $2,500.

Monthly Fee (to ISP)

Wireless Monthly Fee	$ 40
Basic Access 100 Mbps	$ 45
Voice Port	$ 5
Video Port	$ 5

B. Business Open-Access Rates

Business open-access rates vary widely between PUDs. Many PUDs offer two levels of business access. The shared access product is the equivalent of the residential loops. PUDs also offer various kinds of dedicated access, meaning business customers can buy connections that area not shared with any other customer on the network. Following is a discussion of the difference between a shared and dedicated business connection.

Shared versus Dedicated Broadband

Some businesses are willing to pay more for dedicated broadband. To a business, dedicated broadband means two things – the broadband stream is not "shared" with another business, and the amount of bandwidth is guaranteed.

The idea of sharing bandwidth on a fiber network is quaint because data streams of different customers are not mixed in any of the current fiber technologies. Both Active Ethernet and PON technologies on fiber encrypt the bandwidth between the ISP and a given customer in a way that is impossible to crack.

The customer perception of "sharing" broadband comes from the experience of having broadband provided on DSL or cable company networks. Data speeds will slow down for both of these technologies when too many customers are using the network at the same time. Businesses that don't want shared bandwidth really are asking for a bandwidth stream that is not affected by what

their neighbors are doing. If fiber networks are configured properly there will be no noticeable slowdown of broadband speeds unless there is an extraordinary amount of traffic on a network, such as after some sort of major emergency. Businesses are not really concerned about having other businesses listen in on their broadband traffic and this is also not possible on DSL or cable company networks, which also use encryption.

The issue of guaranteed speeds is a lot trickier question on fiber. The difference between shared and dedicated differs depending upon the fiber technology being used.

The technology that businesses most associate with dedicated broadband service is Active Ethernet. This is because there is a dedicated single fiber used between the PUD hub and a business customer using this technology. From a customer perception the fiber is clearly 'dedicated' since there is no last mile network shared with other customers.

But it's also possible to sell dedicated access using Passive Optical Network (PON) technology. This technology is generally considered as shared because as many as 32 customers can share the same fiber between the PUD hub and a customer (or from a neighborhood splitter cabinet and customers).

But is the broadband on Active Ethernet really dedicated, and is it possible for the bandwidth on the PON technology to be dedicated? This answer comes back to the second characteristic of dedicated bandwidth – that the delivery of bandwidth is guaranteed.

It's possible to guarantee bandwidth on an Active Ethernet network, but it's not automatically guaranteed. Consider the simplest example where an ISP is serving and connecting two branches of a business in a city. If the two branches are served by Active Ethernet and the two connections are bridged together at the ISP hub, then the traffic between the two branches of the business are both dedicated and guaranteed. There is nothing other than a fiber cut or an electronics failure that would stop the two branches from communicated with each other at the speed that the customer has subscribed to – if the business has purchased a 100 Mbps data connection at each branch, the bandwidth will always be available at that speed.

But most Active Ethernet connections do not automatically equate to guaranteed bandwidth. Consider a customer that is buying a 100 Mbps connection to the Internet. For that connection to have guaranteed bandwidth, the ISP must not only guarantee the connection from the customer to the hub, but the ISP must guarantee that connection as it passes through the electronics at the hub and must also guarantee the bandwidth on the connection between the ISP and the Internet. A broadband connection can only be characterized as "guaranteed" when those three things are in place, which together mean that a customer can always know that the connection to the Internet will be at the subscribed speed. There are businesses willing to pay extra for this end-to-end guarantee, particularly businesses that conduct a lot of transactions over the Internet such as connecting to other branches of the company, connecting to cloud services, using VoIP telephone services provided over the web, etc. This report was not intended as an engineering report, but there are specific steps than an ISP can take to guarantee each of these network components for a given customer.

It's also possible for a connection using PON technology to be guaranteed. Let's consider the same 100 Mbps connection as described in the last two bullet points – one staying inside the ISP network and one leaving the network to reach the Internet. PON technology can match the dedicated performance of Active Ethernet as long as the local network is configured appropriately. The easiest way to understand this is to consider how PON technology works. PON provides 2.4 gigabits of broadband to use for all of the customers that will be sharing a single PON (meaning sharing the same neighborhood fiber). As long as an ISP does not sell more than 2.4 gigabits of data speeds to the customers on a PON, then every customer is guaranteed to get the amount of subscribed data between the customer and the hub - just like happens on Active Ethernet. Consider an example where 15 customers on a shared PON are each sold a 100 Mbps connection. That totals to 1.5 gigabits of sold capacity and since the PON capacity is greater than what's been sold, then each customer on this example PON have guaranteed broadband between each customer and the hub.

The last concept to consider is what the industry calls oversubscription. Oversubscription comes into play on any part of the network where the aggregate customer subscribed demand is greater than the available bandwidth. A simple example is to look at the situation on a single PON like was just done above. Let's use the same example, but instead of 15 customers buying 100 Mbps on a given PON (which was shown above to allow for each customer to be dedicated), suppose instead that the ISP sells 15 gigabit connections on the PON. If each of the 15 customers tries to make a gigabit connection at the same time, there is not nearly enough bandwidth on the PON. The customers would be demanding 15 gigabits of capacity on a 2.4 gigabit neighborhood pipe. In this situation, the likely outcome would be that all of the businesses would achieve a speed far slower than the subscribed one gigabit speed.

This is where oversubscription comes into play. ISP knows from experience that most customers rarely, if ever, use all of the bandwidth capacity they are buying. ISPs also knows from experience that it's highly unlikely that multiple customers on a PON will ask for a giant burst of data at the same time. Knowing these two facts means the ISP can feel safe in selling more capacity than the 2.4 gigabit capacity of a PON. For example, ISPs would feel totally safe selling fifteen gigabit connections on a residential PON since the probability of this ever being a problem is probably far less than a tiny fraction of 1%. When an ISP like Google Fiber provide a gigabit connection to all residential customers it is counting on the fact that it is safe in oversubscribing a residential PON network. Any customer taking a speed test is going to see speeds at, or just below a gigabit almost all of the time.

It's not quite so easy to oversubscribe a business PON network. There are businesses that use much, or even all of a gigabit connection at times. For instance, a branch of a business might create a VPN to headquarters to download the day's data activity for storage. That transmission could use the entire gigabit connection. Even more routinely, a business might use a hefty portion of a gigabit connection steadily throughout the day for connecting to the cloud and other routine activities.

What's most important about this oversubscription discussion is that the same concept carries through every other portion of the network, not just between the customer location and the hub. There are always other places in the network where it's possible for the amount of data being used

to be greater than the capacity. In the network engineering world, any such place on the network where demanded data could theoretically exceed available data is referred to as a chokepoint.

If an ISP wants to guarantee bandwidth to a customer, that means the broadband connection from that customer has to be guaranteed on the connection between the customer and the hub, but also must be guaranteed at each potential chokepoint.

There is a minimum of three potential chokepoints in a fiber network (but there can be more). I already discussed the fiber connection between the customer and the hub. There is a second potential chokepoint in the electronics that route customer traffic. This is usually some sort of big network router through which the traffic from all customers is passed. The router will determine where to send the traffic. The routing is generally a lot more complex than this simple example, because an ISP might have multiple different routes to get to the Internet to consider in the routing. The bottom line is that if there is ever a time in the day when more traffic hits the router than its capacity, then the chokepoint is full and all of the traffic from the ISP gets slowed until the traffic drops back below the capacity of the router. This is a chokepoint that ISPs don't want to talk about. Many of the problems that customers have with DSL or cable company networks is due to over-busy chokepoints inside the network. An ISP could only solve a router chokepoint by investing in larger capacity electronics or routers. There can be multiple points in the network for this kind of overload – it doesn't have to happen only at one master router but can happen at any intermediate point in a network where traffic from multiple customers is brought together.

The last chokepoint is the connection to the outside world – to the Internet. If an ISP is trying to send out more traffic than the size of the pipe to the Internet, the network bogs down. This can happen on the inbound or outbound path from the Internet to the ISP. Again, in real life this can be a complicated arrangement. An ISP might have backbone connections to multiple different paths to the Internet. An ISP might have dedicated paths called peering arrangements where they send traffic to a single entity like Google, Netflix, or the regional cable company. If any one of the pipes going to and from the ISP gets overly busy, then there is an overloaded chokepoint and traffic slows down.

Creating a dedicated path through the routers and on the path to the Internet can be a challenge. While it's relatively easy to create a dedicated path on the fiber feed to a customer, it's a lot harder to do so further upstream in the network and outward to the world.

Again, this is not intended as a network engineering report, but there are ways to provide dedicated (or nearly dedicated connections) through the various network connections and connections to and from the outside world. For example, an ISP can use Virtual Private Networks (VPNs) to carve out traffic from dedicated customers separately from shared customers on the paths to and from the Internet. It's likely that the ISP will still use some level of oversubscription for connections through routers and to the Internet, but at a much lower of oversubscription than with residential customers. It's harder to establish dedicated paths for some traffic through routers, but it can be done.

The whole point of the discussion above is that an ISP can charge a premium price for dedicated broadband. It's fully justified to charge more, because dedicated network assignments tie up

network capacity even if it's not being used. For example, if a dedicated VPN is created to the Internet, then that capacity can't be used for other customers.

Shared Business Broadband Connections

Shared business broadband connections are often exactly the same as residential connections, and in fact, some PUDs don't distinguish between shared residential and business connections and charge the same price and offer the same bandwidth and features for both.

Some PUDs charge more for a business broadband loop because they know that ISPs are likely to charge more for a business broadband connection. If we look back even a decade ago it was obvious that business customers tended to use more broadband than residential customers. But for the average home and business this has flipped, with home broadband usage far exceeding the usage of the typical small business. There are always some businesses that use gigantic amounts of broadband, but such businesses are the exception rather than the rule.

Most of the Residential PUD rates described above also apply to businesses. Following are the exceptions.

Clallam County PUD

The residential rates listed earlier also apply to businesses. The PUD also offers a 10 Gbps loop for $125 per month, and it's unlikely that any residents would buy such a product.

Grays Harbor PUD

The PUD currently only offers connections for businesses and has no residential open-access loop products. The rates for businesses include:

Non-Recurring Charges (To ISP)	
Standard Connection Fee	$100
Interconnect Fee (One-time fee to activate a part)	$150
Monthly Fee (to ISP)	
Fiber Connection	$ 25
Local Loop	$100

Dedicated Business Connections

Following is a description of the most common dedicated business services.

VLAN. The most common dedicated connection is called a VLAN (Virtual Local Access Network). VLANs use a technology which "tunnels" through the local network, meaning that a 100 Mbps VLAN grabs and reserves a 100 Mbps through each part of the local network (at least to the extent that is possible to do inside of routers and electronics).

There are a few extra features that can come with VLAN service, as follows:

Q in Q Tunneling. This feature layers on top of VLAN service to add a unique tag on every packet from a given customer so that the packets can be identified at every point inside the ISP network. Q in Q tunneling is often used to aggregate packets from multiple locations into one stream. This is the technique that can guarantee that customer traffic is dedicated through electronics like the routers. The ISP will use a different tag for each customer buying the service so that every premium packet in the network is clearly identified. ISPs charge a premium price for Q in Q tunneling since it must be configured into every portion of the network to be effective.

Service Level Agreement (SLA). This is a contract between an ISP and a customer that generally provides penalties on an ISP for not maintaining service to a customer. For example, an SLA contract might make specific guarantees of bandwidth or specific guarantees against network outages and then provide monetary penalties on the ISP for not delivering what was promised. Customers that get an SLA should pay a premium price because they are being guaranteed a premium level of service compared to other customers.

Guaranteed Repairs and Maintenance. One of the most common benefits offered to premium customers is guaranteed priority repairs and maintenance. For example, a premium customer might be guaranteed same-day repair on outages, meaning the ISP will dispatch a maintenance or repair crew in the evening or on weekends. A premium customer might be assigned to a specific customer service representative. Non-premium customers will instead be offered the ISP's normal maintenance and repair practices and schedule. This is something that is often included in an SLA.

Term and Volume Discounts. Premium customers are often offered additional discounts for term and/or volumes. A term discount will provide a lower price for an ISP that contracts for a service for a given term – generally two to five years. Volume discounts are applied to customers that buy multiple connections. The term and volume discounts for premium customers might not be the same as what is available to all other customers.

Bursting. Bursting is the ability for a customer to use more bandwidth than their subscribed speed. A decade ago, there was a movement in the industry to allow customers to turn on and off extra broadband speed and capacity. That turned out to be harder to automate than was desirable, so few ISPs give that automatic control to customers today. But many ISPs are still willing to provide temporary extra broadband to business customers on short notice and would include this as something that can be made available as part of a premium service. This is a feature that would likely be priced specifically for each customer that wants it.

Dark Fiber. This involves selling a fiber that is not connected to electronics. The ISP buying the dark fiber is responsible for providing and operating the electronics necessary use the fiber. Network owners have strong opinions about offering or not offering dark fiber. Some are enthusiastic while some won't sell dark fiber under any conditions. The following issues are involved in deciding to sell dark fiber:

- Most ISPs that sell dark fiber are only willing to do so for fairly long contract terms ranging from 5 years to 20 years. I don't know any ISPs who sell dark fiber connections for shorter terms, and it would be rare for a buyer to want shorter terms. The customer for dark fiber is going to be making a commitment to install electronics and usually wants the connection to last for the length of the expected life of the electronics.

- One of the biggest concerns for selling dark fiber is that it uses fiber that can't be used for anything else. I know ISPs that have sold too many fibers as dark fiber and 10 years later didn't have enough fiber left for other products. It's essential to coordinate the sale of dark fiber with a long-range plan for the network.
- One common way to sell dark fiber is through an IRU (Irrevocable Right of Use). This is a long-term fiber lease that lays out the operational and financial terms for the long-term sharing of fiber. It's not mandatory, but most IRUs require a sizeable payment upfront as part of the arrangement. It's normal for an IRU customer to pay a proportionate share of ongoing network maintenance to keep the fiber operating for the long term. This could be a monthly fee for maintenance or perhaps an occasional assignment of larger fees to cover the cost of repairing fiber cuts or other network events. IRUs generally define the specifics about the processes for the customer to use the fiber and interface with the network. It would not be unusual for an IRU to include collocation for the customer electronics.
- There is no "market" rate for dark fiber and every network owner decides what it's worth for them to sell it. This means you'll find price structure and rates for dark fiber that vary widely. In some cases, a network owner only sells dark fiber under contract and negotiates a price with each separate buyer.

Transport. Transport is fiber that connects more than one location within a local area. As an example, a bank might want a network in a community that connects to several banks along with standalone ATM locations. A transport network most typically brings the traffic from the various locations back to one point of handoff to the customer. The customer uses the transport network to communicate between locations. Transport can also just be used to traverse a network, such as having a carrier wanting a connection that passes north and south through a network. There is often no standard pricing for transport, which is a lit fiber equivalent of dark fiber.

Wavelength. Some PUDs sell transport by a wavelength. This is a function that is provided by certain types of electronics. The most commonly used is DWDM (dense wave division multiplexing). This is technology used for transport fiber – between two network hubs. For example, a PUD might have a network with local hubs located at several electric substations. DWDM technology is one of the types of electronics available for large bandwidth transmission between two places. This is often referred to in the industry as long-haul or back-haul fiber.

The DWDM and similar technologies divide the bandwidth on the network. These channels can be set at different amounts of frequency such as 40, 80, 96, or 160 wavelength paths inside the fiber transmission. Another way that wavelengths are often described is that each wavelength is a different "color" of light. When a PUD sells a wavelength, they are giving all of the capacity in a given wavelength to a customer or ISP. In terms of bandwidth, these are large data pipes that might be 5 to 40 Gigabits of capacity, depending upon the specific brand of electronics being used.

Interconnection. There are open-access products associated with interconnection, which is the process of connecting ISPs to a PUD network. Some PUDs charge nothing for interconnection and assume that the cost of the function is buried in the various loop rates. Other PUDs charge specific interconnection rates. Following are some of the common charges we see for the interconnection function:

Collocation. This is fees for placing equipment in the PUD hub. The fees are often segregated into separate fees for floor space and power. Not all PUDs allow collocation, because this means that technicians from ISPs can have access to the hob electronics location. Some PUDs only hand traffic to ISPs via a fiber connection to someplace outside of the PUD hub. Collocation is not legally required, so the method of interconnecting with ISPs is optional for the PUD.

Transport. This would be a fee for providing a fiber connection between the PUD and an ISP. This could be done for free or could be priced based upon bandwidth, milage or some other basis.

Aggregation. Some PUDs charge for aggregating traffic. This would be the process of gathering the traffic from each of the ISP's customers and delivering the traffic on one data connection.

Open-Access Business Rates

Following are the published premium rates for some of the other PUDs in the state. If not otherwise identified these are monthly rates.

Mason County PUD District 3

No Specific Dedicated Rates

Clallam County PUD

Point-to-Point Transport (within the Clallam network)
Prices include both ends (ports) of a connection

1 Mb	$ 160
10 Mb	$ 200
100 Mb	$ 400
1 Gb	$ 800
10 Gb	$1,600
Additional Ports (greater than 2)	
10 – 100 Mb	$ 50
1 Gb	$ 75
10 Gb	$ 125

Collocation

Full Frame	$ 175
Third Frame	$ 75

Grays Harbor PUD

The PUD offers a circuit on the WDM (wave division multiplexing) network for $150 per month per circuit, and only between a specific list of PUD locations.

Business Loops

It's not specified if these are shared or dedicated	$ 100

Dark Fiber

Dark fiber is sold by the mile of the route.

Up to 30 miles	$ 30 per mile per dark fiber
Over 30 miles	$ 25 per mile per dark fiber

Collocation

Full Cabinet	$ 300
Half Cabinet	$ 175
Third Frame	$ 100
Rack Unit Space	$ 7
Power	$ 18 per 5 amps of breaker capacity
Non-recurring setup	$ 300

Douglas County PUD

VLANs Can include Q in Q routing – prices per port

100 Mb	$ 143
1 Gb	$ 400
10 Gb	$2,000
Additional 10 Gb port	$ 500
Additional other ports	$ 114

Collocation

19-inch shelf	$ 15
Full Cabinet	$ 750
Third Cabinet	$ 250
Power	$ 45
Microwave antenna	$ 167

Grant County PUD

VLANs

10 Mbps port	$ 100
10 Mbps port with Q in Q	$ 150
100 Mbps port	$ 470
10 Mbps port with Q in Q	$ 611
1 Gbps port	$1,450
10 Mbps port with Q in Q	$1,668
Non-recurring setup	$ 500

Wavelengths

1 Gbps - 1 Year	$1,050
1 Gbps - 3 Year	$ 875
1 Gbps - 5 Year	$ 750
OC 48 - 1 Year	$1,050

OC 48 - 3 Year	$ 875
OC 48 - 5 Year	$ 750
10 Gbps - 1 Year	$4,200
10 Gbps - 3 Year	$3,500
10 Gbps - 5 Year	$3,000

Chelan County PUD

Carrier Class VLANs

50 Mbps - Month to Month	$158.95
50 Mbps - 3 Year	$135.11
50 Mbps - 5 Year	$127.16
100 Mbps - Month to Month	$499.50
100 Mbps - 3 Year	$424.58
100 Mbps - 5 Year	$399.60
1 Gbps - Month to Month	$899.00
1 Gbps - 3 Year	$764.15
1 Gbps - 5 Year	$719.20

Dark Fiber

Single Fiber, Minimum contract for 14 miles	$ 608.86
Additional per mile per month	$ 43.49
2 Fibers, Minimum contract for 14 miles	$1,089.48
Additional per mile per fiber per month	$ 39.91
4 Fibers, Minimum contract for 14 miles	$1,986.88
Additional per mile per fiber per month	$ 35.48

Pend Oreille County PUD

VLANs

10 Mbps - Month to Month	$ 600
10 Mbps - 3 Year	$ 550
20 Mbps - Month to Month	$ 950
20 Mbps - 3 Year	$ 800
50 Mbps - Month to Month	$1,250
50 Mbps - 3 Year	$1,150
100 Mbps - Month to Month	$1,500
100 Mbps - 3 Year	$1,350
500 Mbps - Month to Month	$1,800
500 Mbps - 3 Year	$1,650
1 Gbps - Month to Month	$2,000
1 Gbps - 3 Year	$1,850
10 Gbps - Month to Month	$8,900
10 Gbps - 3 Year	$8,500

C. Connection Charges

One of the hardest decisions a PUD faces is charging customers and/or ISPs a sizable fee to connect a new customer to the network. Ideally, PUDs would love to connect customers for no fee, or a minimal fee. PUDs are driven to charge fees due to lack of the capital needed to build the network.

The most extreme examples of charging for a connection comes can be found in Pend Oreille County PUD where customers must pre-pay the entire cost of a fiber drop and electronics. The PUD admits that this likely cuts the customer penetration rate in half. As can be seen from the rates discussed above, there are PUDs that charge very little to add a customer to the network.

Connection Fee Philosophy. We can boil down the options available to a PUD to a range of different rate philosophies, as follows:

- There could be no additional fees for connection and the cost of a connection would be collected over time as part of the access rates.
- There could be a minimal connection fee that compensates for some of the cost of connection up front. This kind of fee would likely be billed to the ISPs and not to end-users, and it would be up to the ISPs if they want to pass on the fee.
- The PUD could charge a more substantial fixed connection fee that would pay for some portion of the connection costs. Such a fee would help to pay for some portion of the cost of the connection.
- The PUD could charge the full cost of the connection up front, meaning that the monthly fees only have to cover operations and the core network.
- Interestingly, in the Mason County PUD the customer charge is higher than the cost of the customer connection and also covers part of the cost of bringing fiber to a home or business. Mason County PUD them amortizes this as a $25 monthly fee collected over 12 years. This up-front financing plan helps the PUD pay for extending the network.

Several of the PUDs have unwritten policies but are willing to negotiate with clusters of customers and/or an ISP willing to contribute to the cost of joining the network in a neighborhood. PUDs universally want to see fiber come to everyone in a county, and many are willing to discuss unique ways to finance the effort.

IV. OPEN-ACCESS FINANCIAL FEASIBILITY

This section of the report examines the financial feasibility of the PUD successfully building and operating an open-access fiber broadband business in the county. Following is a description of the assumptions used in the financial analysis along with the results of our analysis. A table of financial results is included at the end of the report under Exhibit II.

A. Financial Assumptions

Incremental Analysis

It's important to note that all of the projections were done on an incremental basis. This means that the studies only consider new revenues, new expenses, and new expected capital costs. This is the most common way that businesses of all sorts look at potential new ventures since the incremental analysis answers the question of whether any new business line will be able to generate enough revenue to cover the costs.

It's important to understand what an incremental analysis shows and does not show. An incremental analysis is basically a cash flow analysis. It looks at the money spent to launch and operate a new venture and compares those costs to the revenues that might be generated from the venture.

Pricing Strategy

We assumed two goals for the PUD that were instrumental in setting rates. First, the PUD wants the business to at least break even, meaning rates have to be high enough to produce enough revenue for the PUD to cover the cost of operating the business, including repaying the cost of building the network.

The second goal is to provide affordable broadband for residents of the county. As described in section III.A., the PUD provides access with a customer connection fee called a loop rate or access rate. We know by looking around at other PUDs that ISPs tend to mark-up loop rates for residential service by $30 to $35. This means that a $30 PUD loop rate for fiber is likely to translate into starting market broadband rates of $60 to $65.

We also know that ISPs universally charge higher rates for faster broadband products – they charge more for a gigabit product than for a 100 Mbps product. In order to maximize the revenue stream to the PUD, we decided to take advantage of this price differential and charge higher rates for faster broadband products.

We also can see that ISPs tend to charge more to businesses for broadband to residential customers. Again, in an effort to maximize PUD revenues, we suggest charging more for business broadband loops than residential broadband loops.

Setting rates in an open-access environment is not easy because the PUD doesn't have a direct relationship with retail customers that would provide insight into how retail rates affect customer penetration rates on the network. We know at CCG that rates have a big influence on customer penetration rates, but unfortunately, we can't provide any easy rule of thumb because every community is different. We've seen

communities where a large percentage of customers are willing to spend $75 or $80 for broadband and other communities where the difference between $60 and $70 broadband has a big influence on the number of people who will buy service. To make matters more unsettled, you don't currently have a retail ISP on your network who can give you the feedback about the sensitivity of rates in Jefferson County.

Price Steps or Tiers. Another important factor in a rate design is the willingness of customers to upgrade to faster broadband. Many homes buy the lowest-cost broadband product because they can't afford more expensive options, even if they need the faster broadband. The good news on a fiber network is that most homes are going to be satisfied with a symmetrical 100 Mbps connection. But the PUD and the ISPs want customers to buy faster products.

In retail ISPs we refer to this issue as the rate-steps between products. The greater the step between two rates, the bigger the barrier to convincing customers to upgrade to a faster product. We often use the following example when working with retail ISPs to show impact of pricing tiers on customer penetration rates. The following shows an example of how customers choose retail products in various retail rate designs. These results are based upon the experience of some of our customers. Consider a $60 starting broadband product and the following tiered price structures:

	Rate 1	Penetration	Rate 2	Penetration	Rate 3	Penetration
100 Mbps	$ 60.00	95%	$60.00	80%	$60.00	60%
250 Mbps	$ 90.00	4%	$75.00	15%	$70.00	30%
Gigabit	$120.00	1%	$90.00	5%	$80.00	10%

The "Rate 1" column shows retail products with a $30 price differential between rates. "Rate 2" is at $15, and "Rate 3" is at $10. The impact of the rate steps is dramatic. In the Rate 1 example, few customers are going to justify upgrading to the next fastest product for a $30 increase in monthly rates. We have clients with big price tiers where practically every customer buys the lowest-price product.

Contrast this with Rate 3 where the tiers are only $10 apart. In that pricing structure a lot of customers are going to elect faster products when they first take service. It's also relatively easy over time to lure them to use faster products. This can have a drastic difference on the revenue stream for the ISP, but also for customer satisfaction. Customers will grow dissatisfied if they feel like they need faster tiers of service but can't afford the upgrades.

It's an interesting phenomenon and to some degree it's psychological. Customers need to feel like they are getting a fair deal when they agree to pay for faster broadband.

We have also seen that multiple price tiers confuse customers. The above examples have tiers with three prices. We know of ISPs with seven to ten price tiers and in looking at their penetration rates we see that this confuses customers. We have seen the most effective rate structures having no more than four tiers.

Open-Access Loop Rates. We chose the following rates as the starting point in our analysis for the study. These rates will result in the lowest-price residential product of between $60 to $65. We don't know why $70 broadband is a barrier for residential households – but we know it is. We see ISPs like Google Fiber that start prices at $70 getting significantly lower penetration rates than an ISP with $60 starting rates.

Monthly Fee (to ISP)

Residential 100/100 Mbps Loop	$ 35
Residential 250/250 Mbps Loop	$ 40
Residential Gigabit Loop	$ 45
Business 100/100 Mbps Loop	$ 40
Business 250/250 Mbps Loop	$ 45
Business Gigabit Loop	$ 50

Premium Additive – This gets a customer guaranteed priority repair

Residential	$ 15
Business	$ 20

Non-Recurring Connection Charges (To ISP)

Residential	$250
Business	$500

We assumed the relative mix between loop products as followed. This is conservative in that it assumes most residential retail customers will buy the basic broadband product. It's difficult to be less conservative since you don't have an existing residential ISP working with the PUD that could provide feedback.

	Percentage
Residential Fiber Broadband	
Tier 1	90%
Tier 2	7%
Tier 3	3%
Business Fiber Broadband	
Tier 1	60%
Tier 2	30%
Tier 3	5%

Note that the Premium Additive rate guarantees customers with expedited repair service. For example, your normal policy might be that you won't repair customers using the above loop products on evenings and weekends. Some customers are willing to pay extra to get repairs off-hours. This will be more attractive for businesses, but there will be people who work at home who will be willing to pay the rate.

Note that there is a one-time charge to connect to the network. This rate might be different for a customer that needs a new drop constructed, with something lower for a premise that already has a fiber drop. The installation rate is something that ISPs wrestle with. PUDs want to charge something to help offset the cost of connecting the customer to the network. But PUDs quickly learn that if they charge the full cost of installation, penetration rates drop drastically. The above rates are somewhat middle-of-the-road rates derived from looking at the rates charged by the various PUDs.

Above I've assumed these rates are charged to the ISP and must be paid at time of installation. ISPs are free to pass these costs in any manner they choose to customers. For instance, an ISP might eat the business installation cost of they business signs a multiyear contract for service. They might instead elect to spread

the charge over time, split into smaller monthly payments. I think the PUD must charge something for installation, and these rates are probably the highest you can charge without driving away a lot of customers.

Low-Income Pricing. The above pricing does not include any rates for low-income households. It would be possible to charge lower rates for low-income households as long as the ISPs agree to pass along the savings. The main issue with lower rates is that it's going to be hard enough to cover the cost of the business even with the full rates above – which will be discussed below. It's going to be a real challenge to also add low-income rates in addition to these rates.

Carrier and Large Business Rates. As discussed earlier, the PUD also need rates for carriers and larger businesses. These might connection to cell towers or to a customer served by somebody like NoaNet for Zayo. These rates are not highly relevant in the overall revenue structure of an open-access business in the county, mostly due to the relatively low number of business locations today that might be interested in these rates. But that could change over time as 5G or other technologies create more demand for fiber connections in the county.

The rates used in the analysis are:

Carrier Class VLANs	
100 Mbps - Month to Month	$ 500
100 Mbps - 3 Year	$ 300
100 Mbps - 5 Year	$ 200
250 Mbps - Month to Month	$ 700
250 Mbps - 3 Year	$ 500
250 Mbps - 5 Year	$ 300
1 Gbps - Month to Month	$1,150
1 Gbps - 3 Year	$ 900
1 Gbps - 5 Year	$ 650

Network Capital Costs

The telecom industry uses the term capital costs to describe is the industry term for the cost of assets required to operate the business. Following is a summary of the specific capital assets needed for each base scenario. The total amount of capital investment required varies by the number of customers covered by a given scenario since there is a cost at each customer to a fiber drop and fiber electronics.

Capital for broadband networks include several broad categories of equipment including fiber cable, core electronics to light the fiber, huts and cabinets, and fiber drops. The models assume that ISPs will cover the cost of any assets needed inside of customer locations like WiFi routers or cable settop boxes. In addition to capital needed for the network, there are operational capital costs predicted in the projections for assets like furniture, buildings, computers, vehicles, tools, inventory, and capitalized software.

We have tried to be realistic, but a little conservative, in our estimates, so that hopefully the actual cost of construction will be something lower than our projections. One way we were conservative was by adding a 10% construction contingency to the cost of the fiber.

We obtained the cost of constructing the fiber network from the PUD. The PUD subdivided the network into 11 zones and provided fiber and electronics costs by sector. There is a map in Exhibit I that shows each of the five zones as well as the estimated cost of the fiber and the core electronics for each zone. The costs per zone are as follows:

	Fiber	Electronics
Zone 1	$ 5,736,913	$ 439,600
Zone 2	$ 7,658,565	$ 479,800
Zone 3	$ 7,333,506	$ 460,000
Zone 4	$11,299,558	$ 449,000
Zone 5	$ 8,290,416	$ 369,800
Zone 6	$ 6,999,970	$ 499,400
Zone 7	$ 7,124,769	$ 449,800
Zone 8	$ 5,820,705	$ 401,000
Zone 9	$ 4,548,995	$ 642,600
Zone 10	$ 2,431,297	$ 372,400
Zone 11	$ 3,431,358	$ 741,200
Total	$70,676,232	$5,304,600

Customer Costs

Residential Fiber Electronics Costs: The model assumes that the hardware electronics for an ONT cost $375, including the cost of the labor for installation at the home.

We've assumed that the ISPs will provide costs inside the customer premise including wiring, a WiFi router, or other electronics like a settop box.

Fiber Drops: Fiber drops are the fiber that connects from the street to the customer premises. Drop costs vary according to the length of the drop. We looked at the average drop lengths on Google Earth, and using some recent drop pricing in the region came up with the following average drop costs:

Residential Buried	$425
Residential Aerial	$331
Business Buried	$555
Business Aerial	$440

The drops and installation costs are the one portion of this study where the costs could vary. For example, the cost for building drops would likely be higher if constructed by PUD personnel. We've used a reasonable cost that might be obtained by a local vendor.

Total Capital Costs

The capital costs vary according to the customer penetration rate - the base scenario assumes a 40% customer penetration rate. The capital costs would be higher or lower if there were greater or fewer customers. Following are the costs of building the network to maturity for the 12-year build scenario:

Fiber	$77,743,855
Fiber Drops	$ 3,780,896
Electronics	$ 8,798,202
Operational Assets	$ 1,073,573
Total	$91,396,526

We additionally assume that the ISPs will spend $1,053,292 on assets during this same time period.

Customer Penetration Rates

One of the most important variables in the study is the customer penetration rate, or the percentage of the homes and businesses in the community that will buy broadband service.

The first step in looking at customer penetration rate is to determine the potential number of customers that can be served by the network. That is referred to in the telecom industry as passings. The passing by the zones was provided to us by the PUD as follows:

	Residential	Business	Total
Zone 1	1,791	32	1,823
Zone 2	1,994	30	2,024
Zone 3	1,915	10	1,925
Zone 4	1,696	24	1,720
Zone 5	1,315	9	1,324
Zone 6	1,938	34	1,972
Zone 7	1,699	25	1,724
Zone 8	1,617	13	1,630
Zone 9	2,180	8	2,188
Zone 10	1,409	78	1,487
Zone 11	2,525	156	2,681
Total	20,079	419	20,498

The population of the county has been growing and based upon Census data we increased passings by 0.3% per year.

We arbitrarily chose the 40% customer penetration rate. This is based on several factors. First, we know that open-access networks do not attract as many customers as a retail fiber network would likely attract. We know that several of the PUDs with the biggest number of passings have only achieved penetration rates of 50% to 60% after almost 15 years of being in the fiber business. CCG compares that to the performance of retail ISPs in similar markets, and we see that ISPs that own networks get a higher penetration rate.

There might be a variety of reasons why open-access networks don't get as many customers. For example, customers are often put off by having to pay a connection fee. It is likely that the residential ISPs operating on your network are not going to market as aggressively as would a retail ISP that owned the network. The ISPs on the open-access network are likely to be small businesses without a big marketing budget. Where a retail ISP might seek customers by knocking on all doors every year or two, smaller ISPs are likely to advertise more passively.

Finally, penetration rates in rural areas are likely to be significantly higher than in towns where customers can buy broadband from a cable company. While everybody that builds a fiber network knows that they can deliver better broadband on fiber, many customers elect to stick with the existing ISPs in towns.

We also looked at higher and lower penetration rates to understand the impact of the penetration rate on cash flow.

B. Expense Assumptions

As a reminder, unless otherwise noted, all scenarios are created from the perspective of the PUD owning the fiber network and multiple ISPs operating on the network by leasing lit fiber loops from the PUD.

Expenses are the recurring costs of operating the business once it's built. When building financial projections, we strive to be conservatively high with expense estimates. As mentioned earlier, expenses are estimated on an incremental basis. In an incremental analysis it's assumed, for example, that the PUD is already paying for positions like the PUD general manager, an accountant, etc. and that the new fiber venture only needs to operate the open-access business.

The primary expense assumptions are as follows:

Employees: Labor is generally one of the largest expenses of operating a broadband network. The models assume that the PUD will need to hire additional staff to maintain the network and work with the retail ISPs. We have assumed salaries at market rates with an annual 2.5% inflation increase for all positions. The salaries have been increased to account for expenses like benefits, payroll taxes, workman's compensation, etc.

We think the PUD would have to hire the following new employees to operate an open-access network:

Wholesale Customer Service Representative. This position interfaces with the ISPs for taking new orders, answering questions for the ISPs on billing, and receiving trouble reports from the ISPs. We think only one person is needed for this role. If the network is built to the whole county, and if penetration rates grow to 50%, you'd likely need a second person. This assumption assumes that the interface between the ISPs and the PUD for functions like placing orders would be automated in some manner.

Install/Repair Technician. These technicians maintain the network and respond to customer trouble calls. The technicians also maintain outside network electronics and facilities as

well as customer electronics. We've assumed that by the time the business reaches maturity that the business would have 4 Install/Repair Technicians.

Inside Technician. This technician maintains the core network electronics. It would not be unusual in this kind of business to have cross training between the inside and outside techs. In a new market of this size, we're assuming that an ISP would add one new inside technician.

The ISPs operating on the network are likely to add positions. This might include retail customer service representatives, install/repair technicians who would work inside customer premises, and perhaps salespeople.

The studies assume that construction contractors will build the fiber network. We've also assumed that customer installations will be outsourced during the construction process and for the first few years thereafter. Once the bulk of customers has been added the forecasts assume that future installations could be done by company technicians.

Start-Up Costs: To be conservative, the analysis includes start-up costs. There are expenses associated with launching the business that are not accounted for elsewhere. We've assumed the start-up costs are $120,000.

Sales and Marketing Expenses: While the PUD is not a retail provider, we've included a budget for advertising. Other PUDs have learned that customer penetration rates increase if the PUD reminds electric customers that the PUD also offers fibers through the various ISPs. There is a discussion on marketing later in the report.

Delivery of Products: Since the ISPs are the retail service providers there are no product costs in the model. Some PUDs have found that they need to sell wholesale bandwidth in order to entice local ISP businesses to become ISPs. We've not shown this in the models and assume that the PUD would pass along your cost of buying such bandwidth.

Maintenance Expenses: There are a number of routine maintenance expenses that the new business would incur on an incremental basis. These include:

- Vehicle expenses to maintain the vehicles required for the field technicians.
- Computer expenses to support the computers used by employees.
- Tools and equipment expenses.
- Power expenses to provide power to the network.
- General maintenance and repair of the outside plant network and the electronics to repair damaged or nonfunctional electronics.
- Network Monitoring. The PUD might outsource network monitoring to an outside help desk. The retail help desk function of dealing with customers would be performed by the ISPs.
- Maintenance Agreement. We find it likely that you'll buy maintenance agreements on the network electronics.

Taxes: The PUD is not subject to income taxes or property taxes.

The forecasts also do not include any taxes that are assessed to customers, since those taxes would be the responsibility of the ISPs.

Overhead Expenses: The forecasts include a few incremental overhead expenses. These include new expenses like legal, accounting audit expenses, consulting expenses, business insurance, and other similar expenses that are directly related to entering the business. Since we are looking at incremental expenses, we have not shown an allocation of expenses from the utility.

Depreciation and Amortization Expense: The forecasts include both depreciation and amortization expense. These are the expenses recognized by writing off assets over their expected accounting lives. For example, the depreciation rate for a vehicle is 20% per year (is written off over 5 years). The cost of a new vehicle is then depreciated monthly to write off the asset over the 5 years, or 60 months. All hard assets are depreciated except land. Depreciation rates are set according to the expected life of the assets—something that is usually determined to comply with IRS rules and also accounting standard practices. Soft assets like software are instead amortized, using the same process as depreciation.

Financing Assumptions. The base financing assumptions are as follows:

- Base interest rate is 3.25%, which is the highest interest rate the PUD has recently been quoted.
- Financing term is a 25-year loan.
- Its assumed that there is capitalized interest for the first three years, meaning that interest payments for that period are pre-borrowed and added to the cost of the borrowing.

C. Financial Model Results

It is never easy to summarize the results of complicated business plans to make them understandable to the non-financial layperson. In the following summary are some key results of each study scenario that we think best allows a comparison of the numbers between scenarios. These summaries look at the amount of cash generated over the life of the plan.

The way to measure profitability in a new business is going to differ according to the structure of the business. A municipal business, for example, generally measures success by the ability of the business to generate enough cash to operate without any external subsidy. While for-profit business would generally use something like net income to measure profits.

Following are the results of the various scenarios. Note that a table of all of the financial results is included in Exhibit II. That Exhibit makes it easier to compare different scenarios.

Why the Projections Are Conservative

We always try to make our business plans conservative. By conservative, we mean that an actual business plan ought to perform a little better than we are projecting. Following are some of the conservative assumptions used in the business plan:

- The models contain no "home run" revenues. We've projected only a few sales of larger broadband products, and the PUD could do better as shown. You also might lease dark fiber or have other kinds of wholesale revenues that are not projected in the models.
- The forecasts include a 10% contingency on the cost of fiber.
- Our model assumes a regular replacement of electronics. However, it is possible that upgrades will be needed less often than we have shown. Further, our assumption is that the cost of electronics at the time of each upgrade would cost as much as the equipment that is being retired. The experience of the electronics industry is that electronics get cheaper and more efficient over time, so the cost of upgrades is probably going to be less than is shown in the model. The vendors in the industry have also gotten better at having phased upgrades that allow for keeping older equipment in place and not having to replace everything at once, making upgrades less expensive than we have projected.

Open Access – 12-Year Build-out

This is a "slow-build" scenario where you would build one of the 11 sectors each year and finish adding the bulk of customers to the network in the twelfth year. The borrowing is also made each year to pay for the network. While it's unlikely that you'll do exactly this, this model mimics the policies in many PUDs where only parts of the expansion are funded every year.

As a reminder from above, here are the basic assumptions included in the following scenarios:

- All of the above assumptions for revenues and costs are used in the models.
- Fiber is built to pass every home and business in the market.

A summary of all financial results is included in Exhibit II. The following is the results of the base study that includes all of the assumptions discussed above.

	Base
Asset Costs	$91.40 M
Penetration Rate	40%
Loans / Bonds	$120.5 M
Grant / Equity	$ 0.0 M
Cash after 10 Years	$ 0.05 M
Cash after 20 Years	($40.38 M)

This shows a significant cash loss for operating an open-access network with a 40% penetration rate. These results are not unexpected. It would be exceedingly difficult to cover the cost of the network at such a low penetration rate.

Here is what can be learned by the number table above:

- It does not look feasible to operate an open-access network with loop rates starting at $35 and a 40% market penetration rate.

- The losses average out to over $2 million per year. The models show that revenues can cover operating costs, but revenues are not high enough to fund annual debt payments plus to replace electronics and other assets over time.
- The PUD has always assumed that some level of grant funding is required to make the rural parts of the county make financial sense. This base scenario assumes no grant funding or equity infusion by the PUD.
- We also made a rough estimate of how the ISPs would collectively fare on the network. While the PUD is losing $40 million the ISPs collectively make over $25 million over 20 years.

Sensitivity Analysis

We looked at 22 different scenarios where we changed various major assumptions to see if there are scenarios where the open-access business plan can work.

Changing Customer Penetration Rate

The base analysis considered a penetration rate of 40%. We also looked at lowering the penetration rate to 35% and increasing the penetration to 45% and 50%.

The impact of changing penetration rates high or lower by 5% was a change in cash over 20 years of roughly $6.0 million. This means that the impact to the business of a 1% change in penetration rate (from 40% to 41%) is around $1.2 million. We would describe the fiber business plan as being highly sensitive to the customer penetration rate. This means that it will be vital to understand customer demand before launching the business.

Changing Wholesale Rates

We looked at a scenario that changed wholesale rates by $5. Changing wholesale rates upward or downward by $5 per month (changing a rate from $35 to $40) changed cash flow over 20 years by $7.4 million. This means that a $1 change in broadband prices changes 20-year cash flow by approximately $1.5 million. The means the business is highly sensitive to the rates.

However, what this doesn't tell you is how changing rates will change the business. We assume that if the PUD changes rates that the ISPs are going to pass that rate increase along to customers.

What's harder to understand is how the PUDs rates are reflected in ISP retail rates and how customers will react to those rates. For example, it's hard to know if changing retail rates from $65 to $70 will make any significant difference in the number of customers that buy broadband.

The basic study includes the assumption that the PUD changes rates each year by 1%. Changing rates is the only way for the PUD to keep up with inflation. The impact on the business forecasts for never raising rates would be a decrease in cash over 20 years of $6.6 million. We also changed the rates for businesses only and the impact was tiny – there are not many businesses served by the PUD and business rates are not going to have much impact on the performance of the business.

Changing Financing Terms

We looked at the impact of changing the various financing parameters.

Interest Rate. The base study uses the highest interest rate the PUD has been quoted for building a network today – at 3.25%. We looked also at the lowest interest rate available to you today of 1.2%. Dropping the interest rate that much improved cash flow by over $19 million. That change alone cut the projected operating loss in half. The impact of changing the interest rate by one full percent (2% to 3%) changes cash flow by around $9.5 million. The business plan is obviously sensitive to the interest rate and finding a low interest rate has to be one of the key goals of making the business work.

This also means a warning is needed. This particular scenario builds the network over 12 years and finances the new build each year. If the PUD decides to fund the network over time, then there is the risk that interest rates could change to make future construction untenable. The PUD would have to keep a close eye on interest rates and be ready to not proceed with financing if interest rates move too high. We've been lucky for the last decade that interest rates have held steady for years at a time, but over history it's more normal for interest rates to fluctuate.

Loan Term. We looked at the impact of increasing the loan term from 25 years to 30 years. This had a dramatic impact and increased cash over 20 years by almost $10.2 million. This provides a great incentive to consider the longest loan maturity that can be achieved. Longer loans mean lower annual debt payments (just like with a home mortgage). Borrowing can normally be paid-off early, so there is not much risk into getting a long loan term.

We looked at the feasibility of shortening the loan to 20 years and the results were deadly and increased the losses of 20 years by $17.6 million.

Adding 5% to the Cost of Fiber

We examined the impact of changing the cost of the network. In this case, we chose to change the cost of fiber by 5%, or more than $3.5 million. This only changed cash over 20 years by $3.0 million – meaning there is not a big financial penalty for the network costing more. With that said, it would not be a problem if you know about higher network costs before financing. It's much more of a factor if there are cost overruns after the network has been financed.

Install Fees

We looked at the impact of increasing the installation fees. This drives more cash to help pay for the network. The base busines plan assumes an installation fee of $250 for a residential customer and $500 for a business customer. Increasing the installation fee to $1,000 increases cash by $7.1 million. Increasing the installation fee to $3,500 would increase cash by $31.1 million.

However, neither of those numbers reflect the impact on how charging more for an installation would lower the overall penetration rate. There is one PUD in the state that charges about $1,750

upfront for an installation. They estimate that this cuts customer penetration rates roughly in half. But there are other ways to do this. There is a PUD that charges a high install but finances it over twelve years so that the monthly impact to customers is small. But even that scenario is going to reduce penetration rates since there will be renters or others who don't feel able to commit to using fiber for 12 years.

Allocating the Fiber Network to Power

Most electric companies that build a fiber network everywhere allocate some of the cost of the fiber network to the utility. In your case you've already connected fiber to substations, but you can justify allocating more fiber to the utility. There are a number of ways to justify this. First, a fiber network everywhere in the county can let you connect and monitor more electric devices. Second, have a fiber network everywhere effectively acts as SCATA to the home, in that outages on fiber give you immediate feedback on local electric outages and let you pinpoint such outages. Cities with fiber everywhere say that this one aspect of owning a fiber network cut the average length of electric outages in half because the electric utility was able to instantly respond to electric problems.

It will take some though to determine a reasonable amount of fiber that could be allocated to power. I arbitrarily allocated 10% of the fiber network plus 10% of the maintenance costs on the network to power as an example of the possible impact of this adjustment. That change reduced the cash losses on the network by $6.7 million over 20 years.

This implies that the electric utility would somehow pay for some percentage of the network. This could be done in a number of different ways. The utility could fund some of the network. The utility could lease a share of the network. The utility could be assigned a portion of debt, depreciation, maintenance costs.

Property Taxes and Grants

The PUD currently collects about $500,000 in property taxes and is putting that money towards expanding the fiber network. If that money could be earmarked for fiber for 10 years, it would provide $10 million in cash for the business (and lower debt).

We looked at the impact of permanently pledging the property taxes to fiber and also at getting a $10 grant. Getting a grant that is received over ten years improves cash flow by $8.1 million while the property taxes change cash by $8.8 million.

We also calculated the amount of grant needed to make the base business plan break even. It was a staggering $50 million in grants. The amount of needed grant would decrease if other factors were improved, such as funding at a lower interest rate and over a longer loan term.

Combining the Incremental Changes in Cash

The impacts citied for the various variables are somewhat additive. For example, you can estimate the impact of changing two variables like the interest rate and changing rates together to estimate

the impact changing both variables. This isn't always true, but it's a good way to make a rough estimate.

We looked to see if there were changes in some key variables that would be able to bring the 40% scenario closer to breakeven. We only considered changing assumptions that the PUD has some control over.

Changing Interest Rate, Loan Term, and Allocating Fiber to Power. Changing to the lowest 1.2% interest rate and financing for 30 years while also assigning 10% of the cost of the network to power.

These three changes reduced the cash loss over 20 years by over $32 million. The takeaway from this is that there are changes to the basic assumptions I used in the base case that could significantly improve the cash flow of the open-access business.

The Above Change Plus Continuing to use Property Taxes for Fiber. Layering on the annual infusion of property taxes and the above three changes creates a breakeven cash position over 20 years. Note that this could instead come from grant funding.

It's important to note that even when the business plan breaks even over the long run that there are going to be operating losses in the early years of the project that the PUD is going to have to somehow cover.

Open Access – 4-Year Build-out

This uses the same assumptions as the 12-year slow-build scenario except that the network is funded and constructed quickly. The network is built everywhere in two years and the business reaches 40% penetration by the end of four years.

As a reminder from above, here are the basic assumptions included in the following scenarios:

- All of the above assumptions for revenues and costs are used in the models.
- Fiber is built to pass every home and business in the market.

A summary of all financial results is included in Exhibit II. Following are the results of the base study that include all of the assumptions discussed above.

	Base
Asset Costs	$90.50 M
Penetration Rate	40%
Loans / Bonds	$107.4 M
Grant / Equity	$ 0.0 M
Cash after 10 Years	($17.84 M)
Cash after 20 Years	($56.20 M)

This shows a significant cash loss for operating an open-access network with a 40% penetration rate. These results are not unexpected. It would be exceedingly difficult to cover the cost of the network at such a low penetration rate.

Here is what can be learned by the number table above:

- It does not look feasible to operate an open-access network with loop rates starting at $35 and a 40% market penetration rate.
- The losses average out to over $2.8 million per year. The models show that revenues can cover operating costs, but revenues are not high enough to fund annual debt payments plus to replace electronics and other assets over time.
- What might be surprising is the big difference between this scenario and the 12-year buildout. The cash losses in this scenario are $16 greater. The simplest explanation for this is that borrowing money over time instead of at the front end of a project greatly reduces interest expense during the 20 years. In the long run, from perhaps a 20-year perspective, the two scenarios are likely similar. But the reality with the short build schedule is that revenues have to cover all of the debt costs starting from early in the project.

  The other explanation for the greater loss can be seen by noting that there is a cash loss in this scenario after 10 years, while cash was at a breakeven in the 12-year construction scenario. This is due to extra borrowing taken in the 12-year scenario to cover cash losses.
- The PUD has always assumed that some level of grant funding is required to make the rural parts of the county make financial sense. This base scenario assumes no grant funding or equity infusion by the PUD.
- We also made a rough estimate of how the ISPs would collectively fare on the network. While the PUD is losing $40 million the ISPs collectively make over $29 million over 20 years.

Sensitivity Analysis

We looked at 22 different scenarios where we changed various major assumptions to see if there are scenarios where the open-access business plan can work.

Changing Customer Penetration Rate

The base analysis considered a penetration rate of 40%. We also looked at lowering the penetration rate to 35% and increasing the penetration to 45% and 50%.

The impact of changing penetration rates high or lower by 5% was a change in cash over 20 years of roughly $7.5 million. This means that the impact to the business of a 1% change in penetration rate (from 40% to 41%) is around $1.5 million. We would describe the fiber business plan as being highly sensitive to the customer penetration rate. This means that it will be vital to understand customer demand before launching the business.

Changing Wholesale Rates

We looked at a scenario that changed wholesale rates by $5. Changing wholesale rates upward or downward by $5 per month (changing a rate from $35 to $40) changed cash flow over 20 years by

$9.3 million. This means that a $1 change in broadband prices changes 20-year cash flow by approximately $1.8 million. The means the business is highly sensitive to the rates.

However, what this doesn't tell you is how changing rates will change the business. We assume that if the PUD changes rates that the ISPs are going to pass that rate increase along to customers.

What's harder to understand is how the PUDs rates are reflected in ISP retail rates and how customers will react to those rates. For example, it's hard to know if changing retail rates from $65 to $70 will make any significant difference in the number of customers that buy broadband.

The basic study includes the assumption that the PUD changes rates each year by 1%. Changing rates is the only way for the PUD to keep up with inflation. The impact on the business forecasts for never raising rates would be a decrease in cash over 20 years of $6.7 million. We also changed the rates for businesses only and the impact was tiny – there are not many businesses served by the PUD and business rates are not going to have much impact on the performance of the business.

Changing Financing Terms

We looked at the impact of changing the various financing parameters.

Interest Rate. The base study uses the highest interest rate the PUD has been quoted for building a network today – at 3.25%. We looked also at the lowest interest rate available to you today of 1.2%. Dropping the interest rate that much improved cash flow by $24.4 million. The impact of changing the interest rate by one full percent (2% to 3%) changes cash flow by around $12 million. The business plan is obviously sensitive to the interest rate and finding a low interest rate has to be one of the key goals of making the business work.

Loan Term. We looked at the impact of increasing the loan term from 25 years to 30 years. This had a dramatic impact and increased cash over 20 years by almost $12.8 million. This provides a great incentive to consider the longest loan maturity that can be achieved. Longer loans mean lower annual debt payments (just like with a home mortgage). Borrowing can normally be paid-off early, so there is not much risk into getting a long loan term.

We looked at the feasibility of shortening the loan to 20 years and the results were deadly and increased the losses of 20 years by $21.1 million.

Adding 5% to the Cost of Fiber

We examined the impact of changing the cost of the network. In this case, we chose to change the cost of fiber by 5%, or around $3.5 million This only changed cash over 20 years by $4 million – meaning there is not a big financial penalty for the network costing more. With that said, it would not be a problem if you know about higher network costs before financing. It's much more of a factor if there are cost overruns after the network has been financed.

Install Fees

We looked at the impact of increasing the installation fees. This drives more cash to help pay for the network. The base busines plan assumes an installation fee of $250 for a residential customer and $500 for a business customer. Increasing the installation fee to $1,000 increases cash by $8.6 million. Increasing the installation fee to $3,500 would increase cash by $37.8 million.

However, neither of those numbers reflect the impact on how charging more for an installation would lower the overall penetration rate. There is one PUD in the state that charges about $1,750 upfront for an installation. They estimate that this cuts customer penetration rates roughly in half. But there are other ways to do this. There is a PUD that charges a high install but finances it over twelve years so that the monthly impact to customers is small. But even that scenario is going to reduce penetration rates since there will be renters or others who don't feel able to commit to using fiber for twelve years.

Allocating the Fiber Network to Power

I arbitrarily allocated 10% of the fiber network plus 10% of the maintenance costs on the network to power as an example of the possible impact of this adjustment. That change reduced the cash losses on the network by almost $9 million over 20 years.

This implies that the electric utility would somehow pay for some percentage of the network. This could be done in a number of different ways. The utility could fund some of the network. The utility could lease a share of the network. The utility could be assigned a portion of debt, depreciation, maintenance costs.

Property Taxes and Grants

The PUD currently collects about $500,000 in property taxes and is putting that money towards expanding the fiber network. If that money could be earmarked for fiber for 10 years, it would provide $10 million in cash for the business (and lower debt).

We looked at the impact of permanently pledging the property taxes to fiber and also at getting a $10 grant. The property taxes improve cash flow by $10.1 million over 20 years. Getting a grant that is received over ten years improves cash flow by $10.4 million.

We also calculated the amount of grant needed to make the base business plan break even. It was a staggering $53 million in grants. The amount of needed grant would decrease if other factors were improved, such as funding at a lower interest rate and over a longer loan term.

Combining the Incremental Changes in Cash

The impacts citied for the various variables are somewhat additive. For example, you can estimate the impact of changing two variables like the interest rate and changing rates together to estimate the impact changing both variables. This isn't always true, but it's a good way to make a rough estimate.

We looked to see if there were changes in some key variables that would be able to bring the 40% scenario closer to breakeven. We only considered changing assumptions that the PUD has some control over.

Changing Interest Rate, Loan Term, and Allocating Fiber to Power. Changing to the lowest 1.2% interest rate and financing for 30 years while also assigning 10% of the cost of the network to power.

These three changes reduced the cash loss over 20 years by over $42 million. The takeaway from this is that there are changes to the basic assumptions I used in the base case that could significantly improve the cash flow of the open-access business.

The Above Change Plus Continuing to use Property Taxes for Fiber. Layering on the annual infusion of property taxes and the above three changes reduces the cash loss over 20 years to $5.2 million.

It's important to note that even when the business plan breaks even over the long run that there are going to be operating losses in the early years of the project that the PUD is going to have to somehow cover.

What Does the Financial Analysis Tell Us About the Open-Access Business Plan?

In looking at the base study and the numerous sensitivity results, I think the results mean the following:

- A few key variables are extremely important, with the key three being the customer penetration rate, the interest rate on debt, and the term of debt borrowing. Any of these three variables can sink the business if you can't achieve the desired results.
- The corollary of this is that the open-access business can succeed if the PUD can take advantage of every opportunity that will help results. That means getting a combination of some or all of the following:
    - A low interest rate on debt is key. While 3.25% may not sound like a high interest rate, the open-access business is going to have a hard time covering debt at that rate.
    - The PUD elected to use a 40% penetration rate in the analysis to be conservative. However, it's clear that you are going to have to do better than that. Ideally, the penetration rate ought to be at 50% or more to provide some safety for an open-access business plan.
    - Again, since debt payments are one of the most important factors in breaking even, the analysis shows you need to find 30-year debt if at all possible.
    - Infusing some external equity looks to be mandatory. This could be a continuation of using property taxes or grants to support fiber, or some combination of the two.
    - The base analysis starts with a base residential loop rate of $35. That likely translates into a retail rate of around $65. The business plan would benefit by creeping rates higher than $35, but you have to be concerned how high retail rates will impact customer penetration on the network.
    - Even should the PUD find a long-term profitable scenario, the business is going to lose money in the early years and will have to be subsidized until you get to the needed level of customer penetration.

- Any financing "tricks" should be considered. For example, a financing that lets you defer interest payment to later years could really help the business. There are bonds available that have no annual payments, but a balloon note due as a lump sum in future years – this could be attractive if you feel certain of achieving the penetration rates.

Many of the recommendations that are made in this report will be aimed at pinning down the key variables.

Retail Models

Since it looks to be a significant challenge, I also took a quick look at a retail model and looked at both a 4-year and 12-year roll-out as was studied for the open-access scenarios. This might come into play in several scenarios. First would be if the PUD is granted retail authority. There is a bill pending in the legislature now that would allow for that. The retail model could also represent a non-PUD solution for broadband. For example, a cooperative could be formed to provide retail broadband in the county. An outside ISP might get grants and decide to provide broadband.

Please note that this analysis was not as rigorous as the open-access analysis. I did not make as much effort in estimating the operating expenses, so the expenses might be too low. I also did not look at funding sources other than bonds. Alternate funding could change the results in several ways. For example, the infusion of equity would improve the results, while the likelihood that a commercial ISP might pay higher interest rates would go in the other direction. The bottom line is that the results of this analysis should be taken with a grain of salt and the results should be considered as rough estimates of the results of operating a retail ISP for the whole county.

There are a few key differences between the open-access scenario and the retail scenarios to highlight:

- The retail scenario requires more employees. At a minimum there would likely have to be an overall manger and sales/marketing staff.
- A retail ISP would have to cover some significant costs that don't apply to an open-access provider. This includes sales and marketing expenses, billing, buying wholesale broadband, and paying for the installation and electronics inside the premise.

The results of the retail analysis are included in Exhibit II. Since the estimates are high level, I'm only going to point out a few key results of this analysis rather than discussing the specific results, as follows:

- While it looks easier to be profitable with a retail ISP, profitability is not assured. For example, both base cases still lost money over 20 years with a 40% market penetration.
- Interest rates are still a key variable. If anybody other than the PUD is the retail provider, the chances are the interest rates would be higher than the base case and not lower.
- Customer penetration rates are still the most important variable. In general, it's likely that a retail provider would get a higher penetration rate than in an open-access environment – mostly because the retail ISP is highly motivated to get to profitability while the ISPs in the open-access environment don't worry about the PUD's profitability.
- Rates are also a key variable. I assumed that retail rates would begin at $60 for the lowest-speed broadband product. A higher rate would help.
- Grants or other equity still help significantly.
- Overall, it would be easier to find retail scenarios that would break even or be profitable.

V. OTHER ISSUES

A. Finding ISPs

An open-access business model can only be effective if the PUD can attract quality ISPs to operate on the network. The above business plan projections will not be achievable without good ISPs, so finding ISPs is probably the most important aspect of expanding the open-access network.

Following are some suggestions on how to find potential ISP partners.

Business ISPs versus Residential ISPs. PUDs generally have the most luck finding ISPs that want to serve businesses. Once fiber is built, a few national ISPs will likely show up and ask to use the network. This might include ISPs like Lumen Technologies (the new name for CenturyLink), Zayo, and normally at least one or two others. These large ISPs often have the nationwide contract to serve businesses like banks, hotel chains, and nationwide retailers and these ISPs will want to move such businesses to fiber when it becomes available. These same big ISPs also sometimes represent cellular carriers looking for fiber for small cell sites. Included in this list could be a more regional company like NoaNet. Sometimes the big ISPs only ask for fiber to the businesses they already represent, but occasionally one of them will send a salesperson to the market to sell to other businesses.

One thing we can see by looking around at other PUDs – most of the ISPs on your network are going to be somewhat local. If you look at the ISPs serving in the many PUDs in the state, you'll see that most of the ISPs that serve businesses are local to only one or two PUDs.

A few other PUDs I've talked to describe the local ISPs as "homegrown." These local ISPs were likely already working in the community when fiber was built and providing technical services such as IT consulting, or computer and cloud consulting. These technical businesses already have relationships with local businesses that trust them. Other PUDs say that it was a fairly easy sell to convince such businesses that they should bundle in a fiber connection with other existing services.

It's worth noting that these small local ISPs are likely to balk at the paperwork and other requirements the PUDs might want to impose for becoming an ISP on the network. But there is usually a good financial incentive for these companies to expand into the ISP business.

These small ISPs are not going to have any economy of scale. They'll likely have no budget for marketing other than the owner's spare time to knock on a few business doors. It's also likely that these small businesses will be interested in buying as many services as possible from the PUD such as Internet bandwidth.

Unfortunately, as we've seen in other PUDs, these small ISPs are also the ones that won't have long-term staying power. In other markets we've seen small ISPs sell to or merge with other ISPs over time and almost every PUD has stories about how the number of ISPs on the open-access network drops over time.

Finding Residential ISPs. The primary challenge faced by PUDs is finding an ISP willing to serve all residential customers – and ideally to find more than one residential ISP.

A successful residential ISP is going to look significantly different than the small ISPs that serve businesses. Where the business ISP might have dozens of customers, you're going to need to find one or more ISP willing to serve thousands of customers. Such a business has to be good at selling and good at providing the customer service needed to keep customers happy. While the PUD will be providing a fiber network that technically beats the competition, the fees you are going to have to charge for using the network are likely to mean that the ISPs won't be competing on price against the big ISPs already serving the market.

It's unlikely that any residential ISP you attract is going to have deep pockets and excess cash. This means that they will probably never live up to your expectations for sales or service. This is what drives open-access network owners crazy. The PUDs in Washington already sell electricity and other services to the same people served by the ISPs on your fiber network – and the ISPs likely won't live up to the standards you would set for yourself if you were the retail ISP.

Attributes of Good ISPs. What characteristics does the PUD most want out of ISP partners? The answer might not be the same for all ISPs and the PUD might make a different list for residential versus business ISPs, or small versus large ISPs. While your list might be a little different, I suggest the following attributes to consider.

Some important characteristics of a good ISP include:

- A high-quality ISP will have to meet the basic qualification parameters the PUD might establish. This was discussed earlier in the report and I won't repeat the discussion in detail. But the PUD is likely going to want to know about a firm's business viability and the willingness of an ISP to agree to abide by the PUD's rules. The PUD might include mundane things like making sure that an ISP has a valid business license, has insurance, is financial stable, and is willing to meet all regulatory requirements.
- A PUD might insist that an ISP is willing to operate in ways that meet the PUD's way of doing business. This might mean agreeing to such things as operating safely, respecting customer privacy, and not discriminating against the public.
- A good ISP must have some decent level of technical capability. For example, an ISP must be willing to troubleshoot and fix problems inside the customer premise. As obvious as this seems, not all of the ISPs on the network are going to be familiar with fiber technology. Some of them will look at the open-access relationship as a resale arrangement, meaning ISPs will hope the PUD takes care of everything. The PUD needs to expect ISPs to act as ISPs.
- It's going to be extremely difficult for the PUD to understand the financial capabilities of a given ISP. They are not going to be forthcoming about their financial strengths and weaknesses, so the PUD likely only understands the financial capabilities when an ISP puts no effort into marketing or has problems paying the PUD's invoice.
- One of the biggest challenges for smaller ISPs is the ability to meet expected installation and repair schedules. The PUD is going to have expectation that customer problems are remedied in reasonably short time frames.
- ISPs also need to master all of the little attributes that equate to good customer service. That means answering the phone quickly, rendering accurate bills on a predictable schedule, accurately processing customer payments, and resolving customer questions and disputes. Small ISPs often find that these sorts of tasks to be easy when there is a handful of customers but become a challenge if there are suddenly thousands of customers.

- Another important factor is experience. The ideal ISP already works on another open-access network and understand the nuances of the open-access model. Such ISPs will come to the PUD with a wish list of how they hope you will operate. But experience in general is important. A company taking a stab at becoming a residential retail ISP for the first time is going to make a lot of mistakes – the sort of things that an ISP that already serves residential customers will already have learned in the past.
- Another factor that is often overlooked is experience with, or the willingness to work with a government entity like the PUD. ISPs often have a bit of culture shock when they come to work on an open-access network for the first time. The reality is that PUDs are not going to make decisions as rapidly as an ISP might like. It's in the core nature of a PUD to be deliberate and to pass any major decisions up and down the management chain. It's important to understand that ISPs might view the PUD as something less than a great partner at the same time you might view them as less than a great ISP. This is all due to a different set of expectations between commercial companies and government entities.

  A more fundamental issue between the PUD and the ISPs will be a fundamental difference in goals. PUDs might get frustrated when an ISP gets to some comfortable number of customers and stops selling. Every commercial ISP has its own goals that might not align with the PUDs goals. The ISPs individually and collectively might not care if the PUD is losing money. Unfortunately, an open-access arrangement is not a partnership and it's challenging to motivate ISPs to help meet the PUD's goals for sales and customer penetration rates.
- One of the most important attributes of a good ISP partner is that the ISP takes responsibility as needed with customers. Most PUDs will tell you stories of ISPs that blame every problem and outage on the PUD rather than take responsibility for problems created by the ISP. This kind of ISP can be a nightmare for a PUD in terms of tarnishing public perception of the PUD.

We strongly recommend that the PUD make a wish list of attributes expected of an ISP and that you communicate all of the expectations to prospective ISPs. While PUDs are not legally allowed to discriminate, the PUD is probably free to disqualify any ISP that doesn't intend to meet important obligations and requirements. The time to disqualify ISPs is before it gets a bunch of customers, not after.

This also leads to a discussion of "grooming" ISPs. Most of the PUDs that I've interviewed say that in the early days they had to convince local IT consultants and similar businesses into becoming an ISP. As might be expected, these small local businesses did not have a grasp of many of the aspects of being an ISP, such as meeting regulatory requirements. These PUDs have said that they had to coach and coax ISPs to wade through whatever it took to become ISPs. Many PUDs will tell you that they still hold the hand for a few ISPs even years after they have been on the network. The chances are that you're not going to launch an open-access network with great ISPs that suddenly appear and begin competing of their own volition.

Looking for ISPs

One piece of good news is there are already other PUDs that have ISPs working on their networks and you can learn from their experiences in finding and/or grooming good ISPs. Our first piece of advice before looking for ISPs is to interview multiple PUDs about their experiences.

I have one word of caution when talking to ISPs. ISPs are almost universally going to say they are interested in the opportunity, because that's in the general nature of being an entrepreneur. But it's a far cry from being interested in the concept and agreeing to join your network as an ISP. A story I like to tell is about a municipal fiber network that hoped to form a public private partnership. The city talked to every ISP in the region and almost every one of them said they were interested in the idea. But when it came time to find the partner, none of the ISPs was willing to partner in the way that the city had envisioned. The caution is don't get enamored by high level discussions – nothing matters until the whole scenario has been discussed.

There are specific steps you can take that will increase your chance of finding ISPs, as follows.

Request for Information (RFI). One mechanism commonly used that governments might use to look for ISPs is to issue an RFI aimed specifically at soliciting potential ISP partners. An RFI would typically describe the situation in the community, typically describe whatever work has already been accomplished, and describe the opportunity for ISPs to operate on the network. In the case of an open-access network the RFI is going to need to tell a detailed story – what are the PUD's plans and timeline, how does open access function, etc.

The RFI would then ask an ISP to describe themselves and their capabilities. The RFI generally doesn't go so far as to request a specific proposal from ISPs but is used to open up a dialog.

An RFI is generally a first step to determine which regional ISPs might be interested in partnering. After the RFI the process typically moves to one of the two processes described below.

Request for Proposal (RFP). An RFP is typically a lot more in depth. In addition to asking ISPs to introduce themselves, an RFP might ask for specific details about how an ISP would tackle the market. It might go further in detail asking about things like financial strengths and experience.

Direct Negotiation. In most states, governments can interact directly with potential ISP partners rather than go through an RFI or RFP – all depending on state purchasing and contract rules for government entities.

Comparing the Three Options. It's first worth considering the issue from the perspective of an ISP. ISPs are leery of public records laws. ISPs are often highly reluctant to provide financial information, customer lists, or other information that they feel is confidential. They don't trust that local governments will fight to keep such information confidential. ISPs are even more leery of spelling out specific details of their business plan and how they might approach a broadband market – they don't want that information to be available to their competitors.

Many ISPs are not going to be willing or able to respond to an RFI or an RFP that asks for lengthy written responses to a long list of questions. Businesses that sell equipment and services are used to the idea of making written proposals and usually have a pile of pre-prepared canned responses to the typical questions they are asked by a prospective customer. However, an ISP may never have been asked to make a proposal in writing in the specific and detailed way that might be needed to respond to an RFI or an RFP. It's not impossible that some ISPs will walk away from considering the PUD rather than respond to an RFI or RFP.

ISPs prefer direct discussions where nothing is put into writing during the negotiation stage. That's the same process that ISPs typically use when they partner with other ISPs – they sit and talk out the pros and cons and mutually decide if there is a potential for a partnership. As often as not, such discussions end up with the realization that a partnership is not a good idea, and the parties amicably go their separate ways - and nothing they discussed is in writing.

Here is the process that I like best, having been through a lot of discussions between governments and ISPs:

> For most local governments, the best first step is to invite known ISPs for a high-level discussion about the opportunity. This process might involve several meetings where an ISP might come back with ideas, and where the local government reacts.
>
> After talking directly to local potential ISP partners the PUD might then consider an RFI if you haven't found the mix and type of ISPs you were hoping for. If I was doing the search, I'd make sure the RFI made it to every ISP that is working on any PUD network in the state – you never know when an ISP might consider expansion.
>
> But I'd also circulate the RFI more widely. For instance, I'd make sure the RFI makes it to all of the independent telephone companies and independent ISPs in the state. This list is usually on file at the state regulatory commission. You never know that an ISP who has not yet considered working on an open-access network might like the idea. I'd also try to get the RFI into the hands of all of the wireless ISPs in the state.
>
> Finally, I think the PUD ought to talk to at least a few of the larger ISPs in the state. It's unlikely that CenturyLink would agree to operate on somebody else's network in an open-access environment. But it's not so clear that companies like the newly formed Ziply wouldn't consider it.
>
> The whole point of an RFI would be to expand the search to find more candidates to talk to. As such, I recommend that the RFI not ask for a lot of corporate information on RFI respondents. The goal is to engage ISPs in conversation, not turn away ISPs that don't want to answer questions on a public document. The RFI might ask only basic information like asking an ISP to provide their history, and about the products they normally sell, and talking about the management team. While cities might have a hundred questions for a prospective partner, the ISP is going to be a lot happier if the details of their business are not put into writing at the early stage of meeting and negotiating.
>
> RFPs only make sense if everything else fails. If you've tried an RFI with all of the potential partners in Washington, and perhaps even in Oregon, then an RFP might be the mechanism for expanding the search to other states.

Sharing the PUD Philosophy. At some point during the early stages of the process it's vital for the PUD to share your thoughts on how PUDs should act on an open-access network. The steps that you are going to want to take to make sure that ISPs are responsible partners are the same list of

items that ISPs are likely to find irksome. Misalignment of expectations is the number one issue that will cause problems if the expectations are not clearly voiced.

This means that the PUD needs to take the time and finalize goals and to establish processes before seriously talking to ISPs. These items are discussed earlier in the report and it's important for the PUD to work through the various issues.

How to Judge Potential ISPs? There are hundreds of questions that a local government might ask a potential ISP. I advise the PUD to place questions into three categories, 1) make or break questions, 2) questions that might disqualify an ISP, and 3) all other questions.

I can't tell you what your make-or-break questions ought to be. But there are some aspects for an ISP to operate on your network that you are going to insist upon. The questions that might disqualify an ISP are similar concerns, just items that you might have a little flexibility about. These first two categories of questions are the important ones that should be used to qualify accept potential ISPs.

The conclusion of this discussion is that it's going to likely be hard work finding ISPs to operate on your network. This will be made doubly hard if you intend to build the network slowly over a long period of time. ISPs will need to be investing money, staff time, and energy into your market and they need to understand that the venture can profitable.

B. Marketing Plan

I believe that the PUD can take an active role in attracting more customers to a fiber network. Following is a discussion of a few ideas of how you might make this work to help increase customer penetration on a fiber network.

PUD versus ISP Marketing

You must first understand the limitations of PUD marketing. The PUD is not going to want to undertake any marketing that favors one ISP on your network over others. That means you should not be marketing based upon products and prices or any of the characteristics of the ISPs on the network.

Instead, the PUD marketing can be used for two purposes. First is awareness – to make people in the county know there is a fiber alternative available to them for broadband. Second is to extol the benefits of fiber compared to the other broadband technologies available in the county. If you build a fiber network, you have every right to tell the public about how network is technically better than what is offered by the cable company, telephone DSL, or fixed wireless.

Co-Marketing. Co-marketing is the concept of the PUD providing marketing dollars to the ISPs to market. As mentioned several times in this report, you're likely to find that ISPs don't have enough money to market in the most effective manner.

In the early days of market launch, some of the PUDs and Tacoma Click! provided funding to ISPs to assist in marketing campaigns. These are essentially grants made to the ISPs that don't get repaid.

Obviously, the PUD would have a lot of latitude for who you fund and what you fund. You ought to get a concrete proposal for the specific use of the funding before awarding the money. You should feel free to not provide the funding if there is anything about the advertising campaign that makes you uneasy – such as deceptive language or hidden fees.

And the PUD should have some expectation of a return of your advertising dollars, in terms of goals for customer acquisition.

There are parts of the concept that will make your PUD attorneys uneasy – for instance you might decide to fund one ISP but not their nearest competitor. But you should only agree to provide co-marketing funds when you are completely on board with what will be advertised.

Construction Marketing. One of the most effective times to market to people is during the construction process when fiber is being brought down residential streets. This is the time that many fiber-based ISPs sign up a large percentage of customers.

The PUD needs to coordinate any marketing with the ISPs. But consider the situation where there are two residential ISPs operating on your network. The PUD might leave literature with each home that is passed with fiber that extols the benefits of fiber and that introduces the customers to the open-access concept and that invites them to call the two ISPs. The ISPs might be comfortable with the PUD making this first customer touch, with the ISPs then planning to follow this first marketing with additional efforts like knocking on doors.

Filling in Areas with Low Penetration. Invariably, the PUD network is going to differ by neighborhood in fiber penetration rate. There might be a 60% penetration rate in one neighborhood and only half that in another.

We've seen PUDs undertake direct marketing efforts in neighborhoods with low penetration. A marketing plan in this circumstance could look a lot like a marketing plan for an ISP. The PUD might send mail to residents, call residents, or even knock on doors to make sure that households know that fiber is available and that there are ISPs ready to serve them.

Grant PUD had one neighborhood with less than half of the penetration rates of other neighborhoods. For some reason, the original marketing from ISPs had not worked in this small town. The PUD decided to knock on every door in the town that didn't have fiber. This was done many years after the network had been constructed and the PUD found that most homes didn't have the awareness that fiber was available. This marketing campaign by the PUD increased the market penetration rate by a 30% market share.

Generic Marketing. The PUD should also have a strategy for always reminding customers about fiber. You might want to discuss real-life stories about how PUD fiber helped a customer in a newsletter. You ought to include a mention that the PUD offers fiber in anything you mail to customers.

One of the most powerful things the PUD can do is to provide an incentive for employees to promote fiber. One of the most effective ways to sell fiber is when field technicians remind customers that fiber is

available. Having a power technician ask a customer why they aren't using PUD fiber is an incredibly effective way to get a customer to enquire about fiber.

Some PUDs don't like the idea of paying small sales commissions to staff, but you should find ways to motivate staff and to reward them for successfully promoting the fiber network.

C. Recommendations

This list of recommendations is driven by several factors. First, the PUD has expressed a strong desire to bring better broadband to the county. However, the financial outlooks of operating an open-access network looks to be highly challenging and it doesn't look easy finding a path forward that can be profitable. This is compounded by the challenge of finding good ISPs to operate on an open-access network, and some of the recommendations address how to best make that happen.

Establish Concrete Goals

Section I.B. of the report discusses a process for establishing the PUD's goals for broadband, and the Board and PUD should undertake a process to discuss and choose specific goals. Such a list of goals will help with making the decisions included in the other recommendations below. There are broadband categories of goals to determine:

- What are the broadband goals for the community? For example, there is a huge difference between a goal of bringing retail fiber broadband at market rates compared to trying to find a way to bring broadband to every home that wants it.
- The Board needs financial goals. One of the key things to recognize is that none of the PUDs that serve residential fiber customers have been able to yet repay the cost of building the fiber network. The business forecasts in this study show a challenging path to reach cash breakeven, so the Board needs to take a realistic look at your willingness to subsidize broadband to some degree – such as permanently using property taxes to help make broadband work.
- The Board also needs to determine cash flow goals. It's highly likely that even if the business can eventually be cash breakeven that there will be cash losses until the business gets enough customers to reach breakeven. Is the PUD ready to accept cash shortfalls for a while to bring broadband everywhere?
- The Board needs to define what broadband success looks like. There is no standard definition and every PUD and every ISP looks at this uniquely.

Decide If and How to Move Forward

The financial analysis show that it is a big challenge to reach breakeven with an open-access operating model. A number of different key variables need to work out in the PUD's favor to make this work. Making a go of open access requires the following from a financial perspective:

- Getting a high enough customer penetration to make it work. This means something higher than 40%, with something above 50% highly preferrable.
- Success will require getting affordable financing and a low interest rate. It also looks nearly mandatory to get loans of at least 25 years in length, with 30 years being preferrable.
- You're going to need the infusion of equity such as receiving grants, keeping property taxes allocated to fiber, or asking for large contributions from customers.

- You're going to have to find a way to quantify and assign some of the cost of the network to power.
- You might have to charge higher loop rates than used in the analysis, with the result being starting retail broadband rates near to $70 or higher.

With enough of these factors in your favor it looks feasible to have a path forward that can achieve financial breakeven – but there is a lot of work required to make this work.

The PUD's first task is to digest this report to see if you can find a reasonable path forward. This will also require decision on topics like deciding how fast you want to build a fiber network.

Note that CCG and the PUD are currently exploring if there is a business plan that can be made for mixing wireless technology in with fiber. The Board probably will want to see the result of that effort before making any big decisions.

Another option the Board might consider would be to become a retail ISP. That's not a real opportunity unless the state passes legislation to enable retail authority. This study includes a few rough estimates of what a PUD-operated retail business might look like, but you'd want to refine that analysis if this becomes a real possibility.

Pin Down the Key Variables

Assuming you want to keep pursuing the open-access model, then the PUD should start now to pin down the key variables. This might mean taking the following steps:

Understand Residential Demand. The only reliable way to do this is to conduct a statistically valid survey where you ask the public about the various options. You're going to want to know how many people would likely buy broadband from a fiber network at a few key price points like $60 or $70 per month. You are going to want to understand if residents are willing to pay a connection fee at various levels.

Start Solidifying Financing Options. Since interest rate and loan terms are some of the most important variables, you need to start solidifying financing options. You should analyze the difference between bond and other kinds of financing. You might even want to pursue more esoteric types of bond financing such as a bond with a single balloon payment at the end.

Network Costs. I didn't get the impression that the PUD was comfortable with the network cost estimates used in this analysis. At some point before moving forward you might want to get a second engineering estimate to pin down the costs. This would not be an unusual step before tackling a $70 million network.

There is also a possibility that you can tackle something less aggressive than building fiber everywhere. You've already started an investigation to see if there is an opportunity to use wireless technology to serve the more remote parts of the rural areas. Even with a wireless plan the ultimate goal ought to be to eventually build fiber, but significantly lowering the initial capital costs would greatly reduce the risk of the venture.

Equity. In your case, equity means bringing financing that doesn't have to be repaid. The three likeliest sources of equity include grants, a continuation of the use of property taxes to fund fiber, and large up-front contributions from residents to join the network.

Once you've decided to move forward you should adopt a policy of aggressively pursuing grants. Deciding the dedicate the property taxes to fiber is a political decision. You can use the residential survey to explore the issue of customer contributions.

It's likely that none of the scenarios I've created will match your exact view of how to move forward, and it would be easy to create a base model that reflects your best guess.

Define Operational Goals / Processes

Should the PUD decide to move forward, then staff should be directed to define operational goals for the business. These are detailed rules about how the business ought to operate. For example, what's the policy on repairing customer outages? Is next day repair okay? Should repairs be guaranteed in the evenings or weekends? There are other important operational goals, such as a target timeline between taking a customer order and installing fiber.

There is a number of operational goals associated with how to construct the network. How many years should it take to build the whole county? How do you decide what areas to build first? Staff should be tasked with identifying the important operational goals and then start the process of defining how these goals might be met. It's important to know what can and can't be done before ever making promises to the public. To the extent possible, Staff should begin developing the processes needed to implement the gals.

Finding ISPs

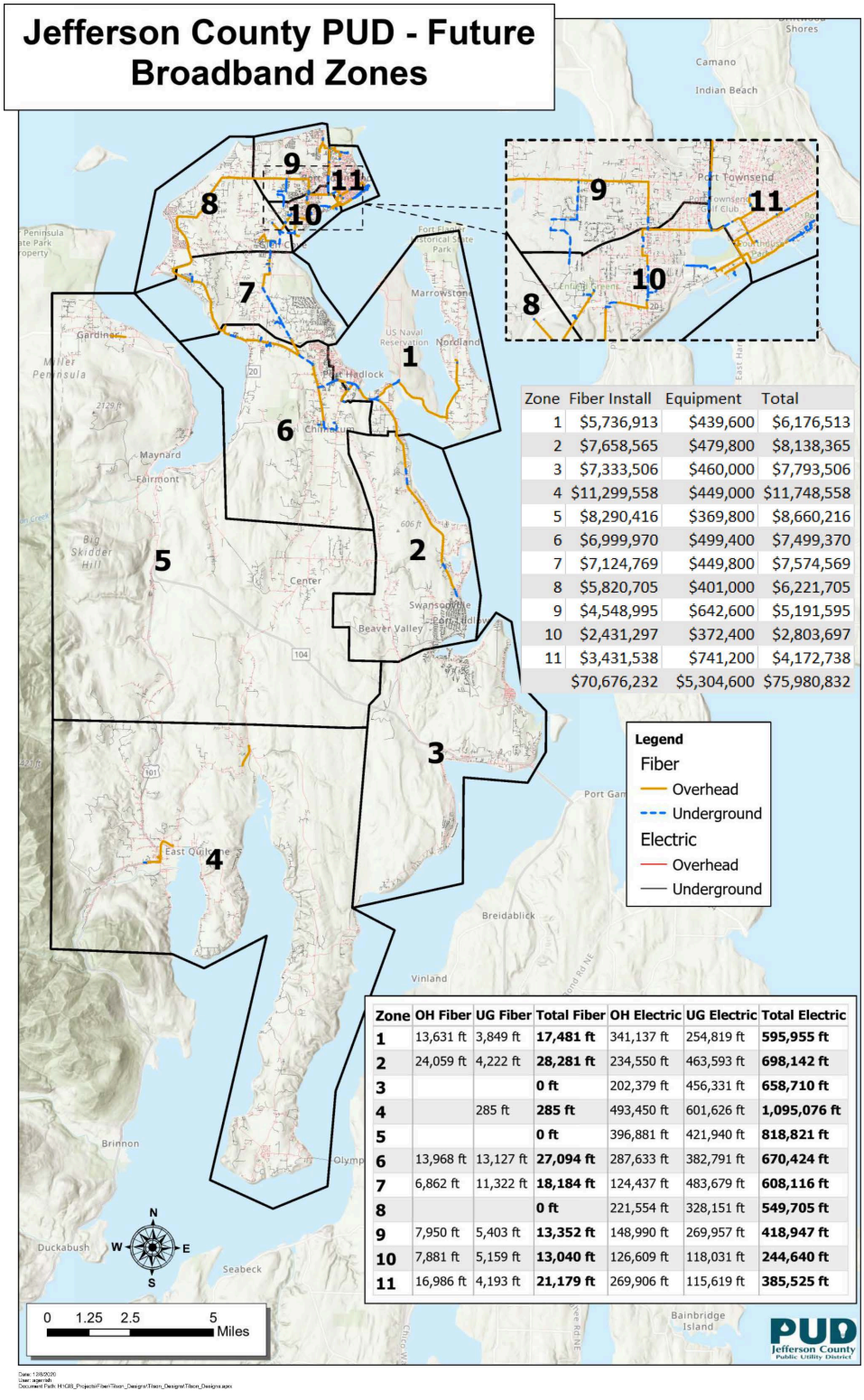
Another key aspect of making a go with open access is finding ISPs to operate on the network. It's a bit premature to think about signing up ISPs until you're sure you're going to build the network. It's also going to be vital to know how fast you're likely to build then network before getting serious with ISPs. But it's not too early now to start putting out feelers and talking to potential ISPS.

Another key step needed before looking for ISPs is to fully define the specific roles of the PUD versus the ISPs so that there is no misunderstanding by ISPs of how you expect them to perform and behave on the network. At the point when the Board is sure you're going to move forward, Staff should be tasked with defining the ISP relationships including the process of developing a portal to communicate with ISPs, defining the needed contracts and paperwork that should be in place between parties, etc.

Bringing in the Public?

The Board needs to determine the extent and the timing of bringing the public into the process – if that is desirable. If the PUD is thinking about launching a retail ISP, I would recommend bringing the public in immediately. However, that's not as obvious for an open-access business where the PUD will have no direct interface with broadband customers. If the PUD decides to bring in the public, I can provide a detailed description of how other fiber providers have included the public in the process.

EXHIBIT I: MAP OF FIBER ZONES



Zone	Fiber Install	Equipment	Total
1	$5,736,913	$439,600	$6,176,513
2	$7,658,565	$479,800	$8,138,365
3	$7,333,506	$460,000	$7,793,506
4	$11,299,558	$449,000	$11,748,558
5	$8,290,416	$369,800	$8,660,216
6	$6,999,970	$499,400	$7,499,370
7	$7,124,769	$449,800	$7,574,569
8	$5,820,705	$401,000	$6,221,705
9	$4,548,995	$642,600	$5,191,595
10	$2,431,297	$372,400	$2,803,697
11	$3,431,538	$741,200	$4,172,738
	$70,676,232	$5,304,600	$75,980,832

Zone	OH Fiber	UG Fiber	Total Fiber	OH Electric	UG Electric	Total Electric
1	13,631 ft	3,849 ft	**17,481 ft**	341,137 ft	254,819 ft	**595,955 ft**
2	24,059 ft	4,222 ft	**28,281 ft**	234,550 ft	463,593 ft	**698,142 ft**
3			**0 ft**	202,379 ft	456,331 ft	**658,710 ft**
4		285 ft	**285 ft**	493,450 ft	601,626 ft	**1,095,076 ft**
5			**0 ft**	396,881 ft	421,940 ft	**818,821 ft**
6	13,968 ft	13,127 ft	**27,094 ft**	287,633 ft	382,791 ft	**670,424 ft**
7	6,862 ft	11,322 ft	**18,184 ft**	124,437 ft	483,679 ft	**608,116 ft**
8			**0 ft**	221,554 ft	328,151 ft	**549,705 ft**
9	7,950 ft	5,403 ft	**13,352 ft**	148,990 ft	269,957 ft	**418,947 ft**
10	7,881 ft	5,159 ft	**13,040 ft**	126,609 ft	118,031 ft	**244,640 ft**
11	16,986 ft	4,193 ft	**21,179 ft**	269,906 ft	115,619 ft	**385,525 ft**

EXHIBIT II: SUMMARY OF FINANCIAL RESULTS

		Maturity Assets	Take Rate	Loans / Bond	Grant / Equity	Year 10 Cash	Year 20 Cash	ISP Cash Year 20
	Open Access 12-Year Build							
1	**Base - No Grant**	$91.40 M	40%	$120.5 M		$ 0.05 M	-$40.38 M	$25.71 M
2	**Lowest Interest Rate - 1.2%**	$91.40 M	40%	$106.5 M		$ 0.04 M	-$21.29 M	$25.71 M
3	**35% Penetration**	$90.49 M	35%	$122.5 M		$ 0.06 M	-$46.38 M	$19.80 M
4	**45% Penetration**	$92.13 M	45%	$118.3 M		$ 0.06 M	-$34.42 M	$31.70 M
5	**50% Penetration**	$93.23 M	50%	$116.0 M		$ 0.05 M	-$28.55 M	$37.54 M
6	**$5 Higher Rates**	$91.40 M	40%	$117.0 M		$ 0.09 M	-$32.97 M	$25.33 M
7	**$5 Lower Rates**	$91.40 M	40%	$123.9 M		$ 0.06 M	-$47.80 M	$28.13 M
8	**No Rate Increase**	$91.40 M	40%	$121.8 M		$ 0.08 M	-$46.97 M	$26.19 M
9	**Charge More for Business Loops**	$91.40 M	40%	$120.3 M		$ 0.11 M	-$39.84 M	$25.49 M
10	**30-Year Loan Term**	$91.40 M	40%	$115.8 M		$ 0.08 M	-$30.18 M	$25.71 M
11	**20-Year Loan Term**	$91.40 M	40%	$128.1 M		$ 0.04 M	-$58.01 M	$25.71 M
12	**5% Higher Fiber Costs**	$94.93 M	40%	$125.7 M		$ 0.07 M	-$43.34 M	$25.71 M
13	**5% Lower Fiber Costs**	$87.87 M	40%	$115.2 M		$ 0.08 M	-$37.42 M	$25.71 M
14	**Allocate 10% of Fiber to Power**	$84.33 M	40%	$109.3 M		$ 0.09 M	-$33.62 M	$25.71 M
15	**Add Manager**	$91.40 M	40%	$123.2 M		$ 0.06 M	-$43.86 M	$25.67 M
16	**$1,000 Install Fee**	$91.40 M	40%	$111.2 M		$ 0.08 M	-$33.25 M	$25.30 M
17	**$3,500 Install Fee**	$91.40 M	40%	$ 80.5 M		$ 0.12 M	-$ 9.20 M	$24.07 M
18	**Infuse Property Taxes**	$91.40 M	40%	$112.6 M	$10.0 M	$ 0.11 M	-$31.54 M	$25.71 M
19	**$10 Million Grant**	$91.40 M	40%	$105.7 M	$10.0 M	$ 0.08 M	-$32.28 M	$25.71 M
20	**Breakeven Grant**	$91.40 M	40%	$ 47.0 M	$50.0 M	$ 1.18 M	$ 0.21 M	$25.71 M
21	**Combine 2, 10, and 14**	$84.33 M	40%	$ 92.9 M		$ 0.06 M	-$ 8.19 M	$25.71 M
22	**Combine 2, 10, 14, and 18**	$84.33 M	40%	$ 86.0 M	$10.0 M	$ 0.05 M	-$ 1.18 M	$25.71 M

		Maturity Assets	Take Rate	Loans / Bond	Grant / Equity	Year 10 Cash	Year 20 Cash	ISP Cash Year 20
	Open Access 4-Year Build							
23	**Base**	$90.50 M	40%	$107.4 M		-$17.84 M	-$56.20 M	$29.22 M
24	**Lowest Interest Rate - 1.2%**	$90.50 M	40%	$ 98.8 M		-$11.13 M	-$31.80 M	$29.22 M
25	**35% Penetration**	$89.70 M	35%	$108.1 M		-$19.75 M	-$63.72 M	$22.69 M
26	**45% Penetration**	$91.32 M	45%	$106.6 M		-$15.96 M	-$48.75 M	$35.74 M
27	**50% Penetration**	$92.54 M	50%	$106.6 M		-$13.57 M	-$41.36 M	$41.99 M
28	**$5 Higher Rates**	$90.50 M	40%	$105.8 M		-$15.43 M	-$46.93 M	$28.79 M
29	**$5 Lower Rates**	$90.50 M	40%	$108.9 M		-$20.31 M	-$65.47 M	$29.65 M
30	**No Rate Increase**	$90.50 M	40%	$107.6 M		-$18.94 M	-$62.86 M	$29.71 M
31	**Charge More for Business Loops**	$90.50 M	40%	$107.3 M		-$17.63 M	-$55.46 M	$28.96 M
32	**30-Year Loan Term**	$90.50 M	40%	$105.3 M		-$14.29 M	-$43.44 M	$29.22 M
33	**20-Year Loan Term**	$90.50 M	40%	$110.7 M		-$23.75 M	-$77.34 M	$29.22 M
34	**5% Higher Fiber Costs**	$94.04 M	40%	$111.9 M		-$18.96 M	-$60.16 M	$29.22 M
35	**5% Lower Fiber Costs**	$86.97 M	40%	$102.8 M		-$16.79 M	-$52.24 M	$29.22 M
36	**Allocate 10% of Fiber to Power**	$83.44 M	40%	$ 98.0 M		-$15.40 M	-$57.23 M	$29.22 M
37	**Add Manager**	$90.50 M	40%	$108.5 M		-$18.89 M	-$60.09 M	$29.19 M
38	**$1,000 Install Fee**	$90.50 M	40%	$ 98.8 M		-$15.48 M	-$47.64 M	$29.19 M
39	**$3,500 Install Fee**	$90.50 M	40%	$ 80.2 M		-$ 3.34 M	-$18.38 M	$28.80 M
40	**Infuse Property Tax**	$90.50 M	40%	$103.6 M	$10.0 M	-$15.02 M	-$46.06 M	$29.22 M
41	**$10 Million Grant**	$90.50 M	40%	$100.0 M	$10.0 M	-$12.21 M	-$45.94 M	$29.22 M
42	**Breakeven Grant**	$90.50 M	40%	$ 58.5 M	$53.0 M	$ 8.24 M	$ 0.45 M	$29.22 M
43	**Combine 24, 32, and 36**	$83.44 M	40%	$ 88.4 M		-$ 6.23 M	-$14.18 M	$29.22 M
44	**Combine 24, 32, 36, and 40**	$83.44 M	40%	$ 85.1 M	$10.0 M	-$ 3.64 M	-$ 5.20 M	$29.22 M

		Maturity Assets	Take Rate	Loans / Bond	Grant / Equity	Year 10 Cash	Year 20 Cash
	Retail Provider - 12 Year						
45	**Base**	$95.21 M	40%	$112.3 M		$ 0.09 M	-$11.98 M
46	**Lowest Interest Rate - 1.2%**	$95.21 M	40%	$ 99.9 M		$ 0.03 M	$ 6.21 M
47	**35% Penetration**	$94.14 M	35%	$116.5 M		$ 0.06 M	-$23.41 M
48	**45% Penetration**	$96.32 M	45%	$107.5 M		$ 0.06 M	-$ 0.28 M
49	**Breakeven Penetration**	$96.52 M	46%	$106.7 M		$ 0.05 M	$ 2.02 M
50	**$5 Higher Rates**	$95.21 M	40%	$109.1 M		$ 0.10 M	-$ 4.91 M
51	**30-Year Loan Term**	$95.21 M	40%	$107.9 M		$ 0.08 M	-$ 2.26 M
52	**5% Higher Fiber Costs**	$95.75 M	40%	$117.5 M		$ 0.07 M	-$14.91 M
53	**10% to Power**	$88.14 M	40%	$101.3 M		$ 0.04 M	-$ 5.24 M
54	**Property Tax Infusion**	$95.21 M	40%	$104.5 M	$10.0 M	$ 0.10 M	-$ 3.17 M
55	**$10 Million Grant**	$95.21 M	40%	$ 97.8 M	$10.0 M	$ 0.03 M	-$ 3.87 M
	Retail Provider - 4 Year						
56	**Base**	$92.27 M	40%	$105.4 M		-$ 9.04 M	-$20.67 M
57	**Lowest Interest Rate - 1.2%**	$92.27 M	40%	$ 97.6 M		-$ 2.28 M	$ 3.12 M
58	**35% Penetration**	$91.33 M	35%	$107.0 M		-$12.78 M	-$35.10 M
59	**45% Penetration**	$93.23 M	45%	$103.7 M		-$ 5.32 M	-$ 6.43 M
60	**Breakeven Penetration**	$93.80 M	48%	$102.8 M		-$ 3.03 M	$ 2.13 M
61	**$5 Higher Rates**	$92.27 M	40%	$104.0 M		-$ 6.66 M	-$11.84 M
62	**30-Year Loan Term**	$92.27 M	40%	$103.4 M		-$ 5.51 M	-$ 8.14 M
63	**5% Higher Fiber Costs**	$95.80 M	40%	$109.9 M		-$10.14 M	-$24.61 M
64	**10% to Power**	$85.20 M	40%	$ 96.2 M		-$ 6.52 M	-$11.75 M
65	**Property Tax Infusion**	$92.27 M	40%	$101.8 M	$10.0 M	-$ 6.17 M	-$10.55 M
66	**$10 Million Grant**	$92.27 M	40%	$ 98.2 M	$10.0 M	-$ 3.31 M	-$10.44 M